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# THE NASA DIGITAL VGH PROGRAM - EXPLORATION OF METHODS AND FINAL RESULTS

## Volume II - L 1011 Data 1978-1979: 1619 HOURS

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## FOREWORD

This report was prepared by Eagle Engineering, Inc., Hampton Division, under contract NASW 4430, sponsored by NASA Langley Research Center and the Federal Aviation Administration Technical Center under the FAA-NASA Interagency Agreement No. DTFA03-890-A-00019 of 13 June 1989. This report fulfills the requirement of the Program Plan for the National Aging Aircraft Research Program, DOT/FAA/CT-88/32, August 1989, Paragraph 2.3.2.1, Flight Loads.

The Eagle Engineering, Inc. effort was performed by Norman L. Crabill and administered under the direction of Joseph W. Stickle (NASA Langley Research Center) and Thomas DeFiore (FAA Technical Center).







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THE NASA DIGITAL VGH PROGRAM-  
EXPLORATION OF METHODS AND FINAL RESULTS  
Volume II: L 1011 Data 1978-1979: 1619 Hours  
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#### SUMMARY

Data obtained from the Digital Flight Data Recorder system of a L 1011 aircraft in 914 flights and 1619 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Data on conditions with flap deployment and autopilot use are given. In addition, acceleration statistics are presented from 23 hours on nonrevenue flights.

#### INTRODUCTION

This document presents the results of the NASA DVGH Program obtained during 1978-1979 operations of a Lockheed L 1011 aircraft. This volume is an extension of the work and methods documented in Volume I. The data reduction analysis and methods, and data presentation are essentially the same as those reported in Volume I. However, this report does contain additional data on autopilot usage and some limited acceleration-derived exceedance data obtained from non-revenue flights.



## AIRCRAFT AND INSTRUMENTATION

### Aircraft

The aircraft was a Lockheed L 1011 as in Volume I. Aircraft characteristics used in the analysis are given in Table I; the configuration is shown in figure 1 with the location of the accelerometers as indicated.

### Instrumentation

The data were obtained from the Digital Flight Data Recorder system described in Volume I. Measurements were:

<u>Parameter</u>	<u>Range and Units</u>	<u>Samples per Second</u>
$a_n + 1$	-3g to +6g	4
$a_y$	-1g to +1g	4
CAS	100 to 450 kts	1
HP	-1,000 to 50,000 ft	1
FLP	-5° to 60°	1
Autopilot Status	Off or On	Discrete

Note that Spoiler data are not reported here, although they were in Volume I.

### SCOPE OF DATA

Data were collected from a single aircraft operating in regular airline service over the service area shown in figure 2 during 1978 and 1979. Almost all of the data (914 flights and 1619 hours) were obtained during passenger-carrying revenue service; a

small amount (56 flights and 23 hours) was obtained during non-revenue service (ferry flights mainly, although some training and maintenance flights may have been included). As in Volume I, some gaps in the data exist due to faulty or missing records, etc., but this is believed to be small (less than 10 percent of the number of flights).

#### DATA REDUCTION PROCESS

The Data Reduction Process is basically the same as described in Volume I. The filter used to separate maneuver and gust accelerations was the same since the data are for the same type of aircraft described in Volume I. Although the results of reference 13 in Volume I indicate that the operation of the autopilot can cause up to a 20 percent reduction in the normal acceleration peak response to continuous turbulence, it was decided, after consultation with the industry, not to account for this in deriving  $U_{de}$ , in order to maintain comparability with the earlier VGH results, even though the autopilot status was being monitored in this investigation.

#### RESULTS

##### Flight Profile and Acceleration Derived Statistics

Presentation of Flight Profile Statistics results is similar to that described in Volume I. Flight Profile Statistics are given in Percent of Time, and as Maximum Values on a Percent of Flight basis for Entire Flights (flaps up or down) and for Flaps Deflected. For operations reported in this volume, the conditions

existing during flap retraction after lift off, and the conditions existing during flap deflection before landing are given.

Acceleration Derived Statistics are also presented as in Volume I, except that with Flaps Deflected, the maximum  $a_n$  and Equivalent Airspeeds during that part of the flight are presented for the various flap detents in take off and landing. Also new are level crossing counts for the Acceleration Derived Quantities for non-revenue ferry, training, and maintenance flights. All other results are for revenue flights. The Acceleration Derived quantities are subject to the same limitations discussed in Volume I, which indicates that the exceedances derived from the DFDR system at 4 samples per second may be significantly less than if actual peak values were counted.

The detailed Flight Profile and Acceleration Derived Statistics are given in figures 3 through 24 as shown in Table II. No discussion of the data is presented.

#### Autopilot Usage

Autopilot status was monitored as off, or on, without regard to the exact on-mode. The altitudes for autopilot turn-on during climb, turn-off during descent, and percent-of-time and percent-of-flights it was on are given in figure 25. The characteristics of a low amplitude oscillation in normal acceleration that appears sporadically in cruise, as first reported in Volume I, are summarized in figure 26. This phenomenon is believed to be due to off-nominal autopilot operation in the altitude-hold mode. The presence of such a low-frequency resonance was predicted in reference 13. Figure 27 shows normal acceleration power spectra

with autopilot off and on. It can be seen that the effect of the autopilot operation is to shift the gust response of aircraft to a higher frequency, that is from 0.35 Hz to 0.8 Hz in this example as predicted in reference 13. Reference 13 also indicates that another effect of the autopilot is a reduction in the gust response by 10 to 25 percent. However, these autopilot effects were not factored into the  $U_{de}$  transfer function in this analyses in order to maintain comparability with the previous VGH results.

#### CONCLUDING REMARKS

Data obtained from the Digital Flight Data Recorder system of an L 1011 aircraft in 914 flights and 1619 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Some new data on conditions with flap deployment and autopilot usage are given. In addition, acceleration statistics are presented from 23 hours on non-revenue flights. No general discussion of the data is presented.

TABLE I  
LOCKHEED L 1011-1 CHARACTERISTICS USED IN THE ANALYSIS

- o Geometrical Characteristics
  - o Wing Area  $S = 3456 \text{ ft}^2$
  - o Wing Mean Chord = 22.3 ft
- o Lift Curve Slope  $C_{L\alpha}$  per degree

Flaps up = $f(M, HP)$					Flaps Down = $f(FLP)$	
<u>M</u>	<u>HP = 0</u>	<u>10kft</u>	<u>20kft</u>	<u>40 kft</u>	<u>FLP, deg</u>	<u>HP = 0</u>
.20	.0923	.0928	.0929	.0936	0	.0925
.35	.0923	.0928	.0930	.0938	4	.0973
.50	.0913	.0920	.0929	.0946	10	.0980
.60	.0918	.0928	.0940	.0963	18	.0975
.70	.0940	.0954	.0970	.1003	22	.0971
.80	--	.1038	.1058	.1100	27	.0962
.89	--	.1210	.1240	.1305	33	.0948
.91	--	--	.1227	.1286	45	.0912
.95	--	--	.1030	.1081		

- o Weight was computed linearly with time from take off to landing as described in Appendix C in Volume I.

TABLE II  
INDEX OF FLIGHT PROFILE AND ACCELERATION STATISTICS

FLIGHT PROFILE STATISTICS

o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
3	Weight vs. Flight Duration	12-17
4	Altitudes and Gross Weights	18
5	Altitudes and Airspeeds	19-22
6	Altitude Summary	23
7	Maximum Altitudes	24-25

o FLAPS DEFLECTED

8	Flap Detent Use	26
9	Weights, Altitudes and Airspeeds	27-33
10	Flap Deflection Times	34-36
11	Equivalent Airspeeds and Detents	37
12	Flap Use above 10,000 ft	38-39

TABLE II (continued)

ACCELERATION DERIVED STATISTICS

o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
13	Normal Acceleration Exceedances	
(a)	$a_n$ matrix	40
(b)	$a_{nM}$ matrix	41
(c)	$a_{nG}$ matrix	42
(d)-(k)	$a_n$ , $a_{nM}$ , $a_{nG}$ plots	43-52
14	Lateral Acceleration Exceedances	
(a)	$a_y$ matrix	53
(b)-(k)	$a_y$ plots	54-63
15	$U_{de}$ Exceedances	
(a)	$U_{de}$ matrix	64
(b)-(k)	$U_{de}$ plots	65-74
16	Peak Positive and Negative $a_n$ vs. Altitude	
(a)	$a_n$ matrix	75
(b)-(k)	$a_n$ plots	76-85
17	Peak Positive and Negative $a_{nM}$ vs. Altitude	
(a)	$a_{nM}$ matrix	86
(b)-(k)	$a_{nM}$ plots	87-96
18	Peak Positive and Negative $a_{nG}$ vs. Altitude	
(a)	$a_{nG}$ matrix	97
(b)-(k)	$a_{nG}$ plots	98-107

TABLE II (concluded)

19 Peak Positive and Negative  $U_{de}$  vs. Altitude

(a)	$U_{de}$ matrix	108
(b)-(k)	$U_{de}$ plots	109-118

o FLAPS DEFLECTED

Figure Number	Subject	Page Numbers
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20  $a_n$  Exceedances with Flaps Deflected

(a)	Take Off Detents matrix	119
(b)	Take Off Detents plot	120
(c)	Landing Detents matrix	121
(d)	Landing Detents plot	122

21 Peak Positive and Negative  $a_n$  per flight and EAS bands

(a)-(d)	Take Off Detents	123-126
(e)-(k)	Landing Detents	127-133

o NON-REVENUE FLIGHTS

Figure Number	Subject	Page Numbers
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22 Normal Acceleration Exceedances

(a)	$a_n$ matrix	134
(b)	$a_{nM}$ matrix	135
(c)	$a_{nG}$ matrix	136
(d)	$a_n$ , $a_{nM}$ , $a_{nG}$ plots	137-146

23 Lateral Acceleration Exceedances

(a)	$a_y$ matrix	147
(b)-(k)	$a_y$ plots	148-157

24  $U_{de}$  Exceedances

(a)	$U_{de}$ matrix	158
(b)-(k)	$U_{de}$ plots	159-168

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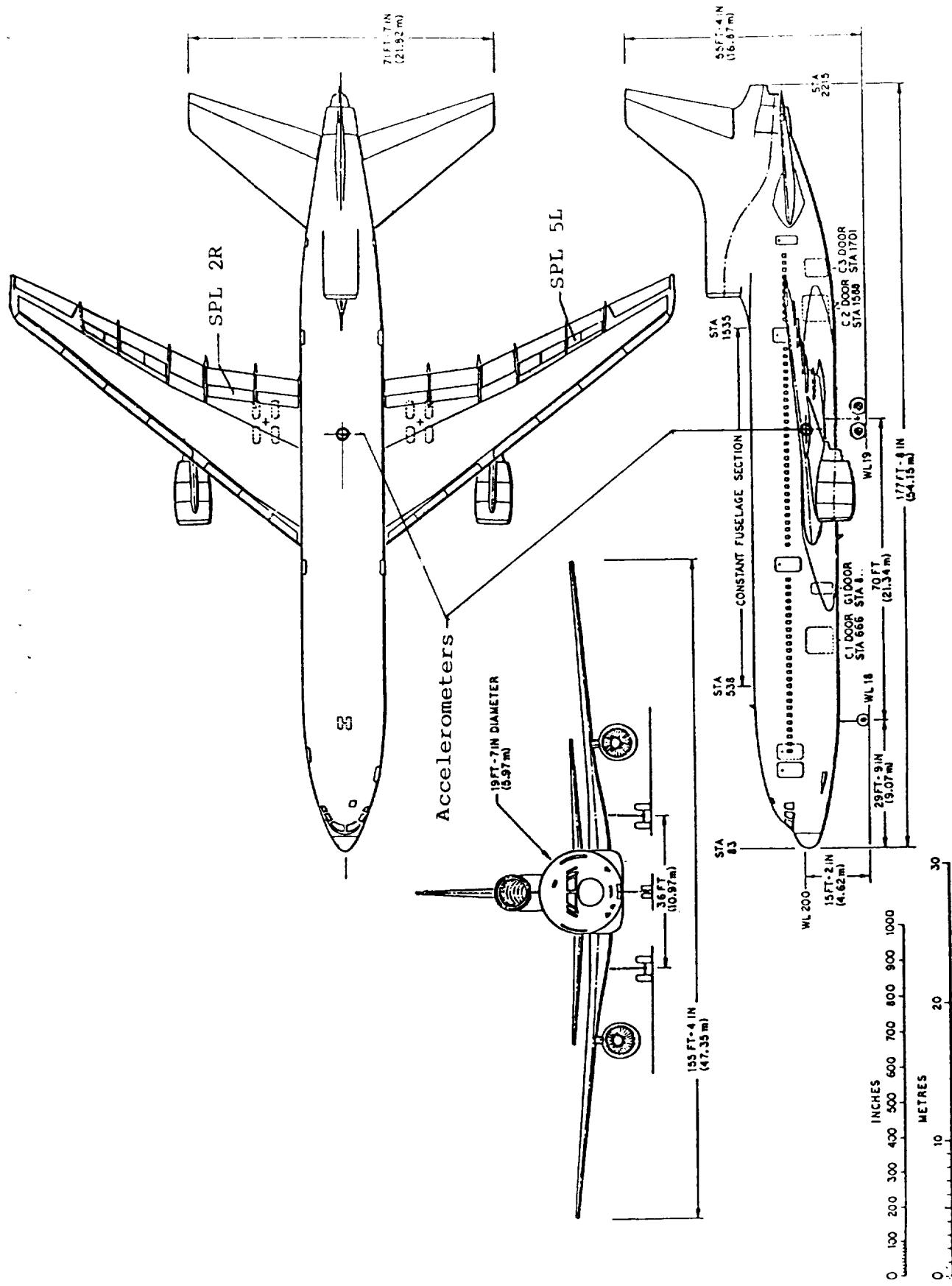
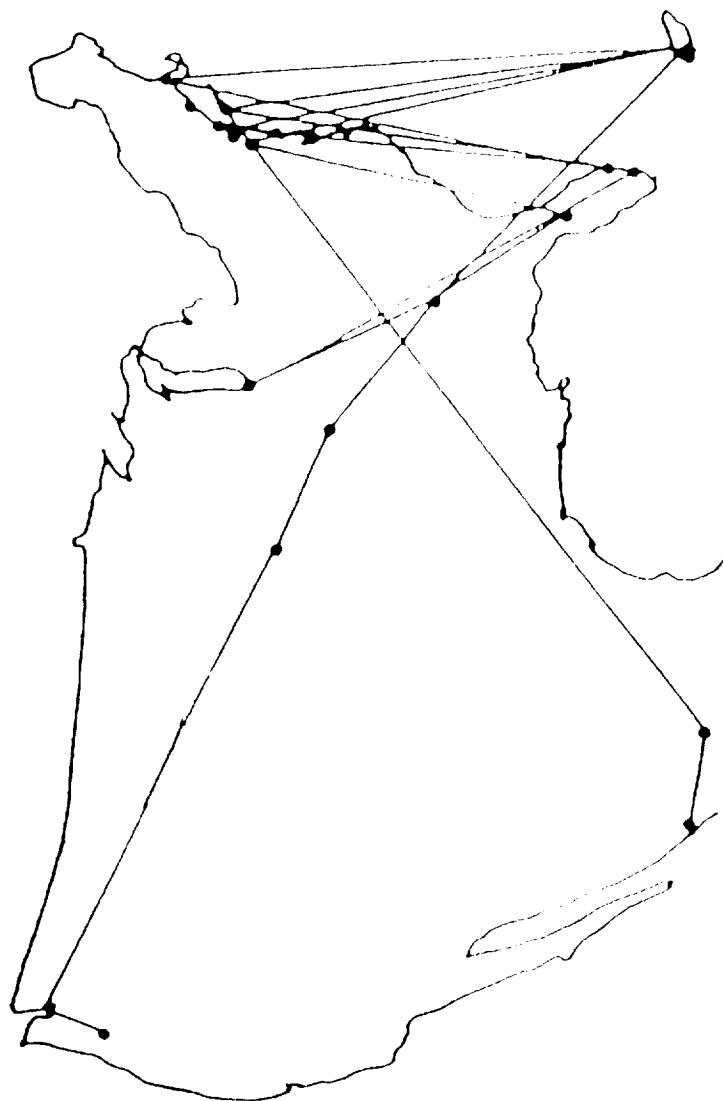


FIGURE 1.- Aircraft three-view with locations of accelerometers and spoilers.



MARCH 1978 - JULY 1979

914 FLIGHTS

1619 HOURS

700,000 N. MILES

FIGURE 2.- Location of service area and scope of data.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS											
	250 TO 270 KIAMS	270 TO 290 KIAMS	290 TO 310 KIAMS	310 TO 330 KIAMS	330 TO 350 KIAMS	350 TO 370 KIAMS	370 TO 390 KIAMS	390 TO 410 KIAMS	410 TO 430 KIAMS	430 TO 450 KIAMS	450 TO 470 KIAMS	470 TO 490 KIAMS
6.5-7.0	0	0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0	0	0.1	0.1	0	0
4.5-5.0	0	0	0	0	0	0	0.1	0.1	0.1	0.3	0.2	0
4.0-4.5	0	0	0	0	0	0	0.2	0.8	1.0	1.0	0.1	0.7
3.5-4.0	0	0	0	0	0	0	0.7	1.3	1.6	1.6	0	0
3.0-3.5	0	0	0	0	0	0.1	1.5	3.8	3.0	0.4	0	0
2.5-3.0	0	0	0	0	0.1	0.8	1.9	3.4	2.6	0.2	0	0
2.0-2.5	0	0	0	1.3	3.9	6.2	4.9	0.5	0.5	0	0	0
1.5-2.0	0	0	0.1	1.1	3.6	3.9	2.5	0.1	0	0	0	0
1.0-1.5	0	0	0.5	2.4	4.9	6.0	1.5	0	0	0	0	0
.8-1.0	0	0	0.2	1.4	2.7	1.4	0	0	0	0	0	0
.6-.8	0	0	0.5	1.9	1.2	0.7	0	0	0	0	0	0
.5-.6	0	0	1.4	2.2	2.2	0.9	0	0	0	0	0	0
.4-.5	0	0.3	1.6	2.6	1.4	0.5	0	0	0	0	0	0
.3-.4	0	0.3	1.9	2.5	1.5	0	0	0	0	0	0	0
.0-.3	0	0.2	0.5	0.7	0.1	0	0	0	0	0	0	0
<b>TOTAL PERCENTS, ALL FLIGHTS</b>	<b>0</b>	<b>0.9</b>	<b>6.9</b>	<b>16.2</b>	<b>22.5</b>	<b>24.1</b>	<b>18.5</b>	<b>9.3</b>	<b>1.6</b>			

(a) Gross weight at take off

Figure 3.- Percent of flights: Weight vs duration.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS											
	250 TO 270 KIAMS	270 TO 290 KIAMS	290 TO 310 KIAMS	310 TO 330 KIAMS	330 TO 350 KIAMS	350 TO 370 KIAMS	370 TO 390 KIAMS	390 TO 410 KIAMS	410 TO 430 KIAMS	430 TO 450 KIAMS	450 TO 470 KIAMS	470 TO 490 KIAMS
6.5-7.0	0	0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0.1	0.1	0.1	0	0	0	0	0	0
4.5-5.0	0	0.1	0.1	0.1	0.3	0.2	0	0	0	0	0	0
4.0-4.5	0	0	0.5	1.1	0.4	0	0	0	0	0	0	0
3.5-4.0	0	0	0.4	2.2	1.5	0.1	0	0	0	0	0	0
3.0-3.5	0	0.1	0.5	4.2	3.6	0.4	0	0	0	0	0	0
2.5-3.0	0	0.1	1.4	2.4	4.5	0.5	0	0	0	0	0	0
2.0-2.5	0	1.0	3.3	6.2	5.7	0.8	0	0	0	0	0	0
1.5-2.0	0	0.7	1.5	4.3	4.3	0.7	0	0	0	0	0	0
1.0-1.5	0	0.4	2.7	4.9	6.1	1.2	0	0	0	0	0	0
.8-1.0	0	0.2	0.4	3.2	2.0	0	0	0	0	0	0	0
.6-.8	0	0.1	1.5	1.4	1.2	0	0	0	0	0	0	0
.5-.6	0	0.3	2.3	2.2	1.3	0.5	0	0	0	0	0	0
.4-.5	0	0.8	2.2	2.1	1.3	0.2	0	0	0	0	0	0
.3-.4	0	0.5	2.5	2.1	1.1	0	0	0	0	0	0	0
.0-.3	0	0.2	0.5	0.7	0.1	0	0	0	0	0	0	0
<b>TOTAL PERCENTS,</b>												
<b>ALL FLIGHTS</b>	<b>0</b>	<b>4.6</b>	<b>20.2</b>	<b>37.3</b>	<b>33.4</b>	<b>4.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

(b) Gross weight at landing

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS											
	10 TO 30 KIAMS	30 TO 50 KIAMS	50 TO 70 KIAMS	70 TO 90 KIAMS	90 TO 110 KIAMS	110 TO 130 KIAMS	130 TO 150 KIAMS	150 TO 170 KIAMS	170 TO 190 KIAMS	190 TO 210 KIAMS	210 TO 230 KIAMS	230 TO 250 KIAMS
6.5-7.0	0	0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0	0
4.5-5.0	0	0	0	0	0	0	0.3	0.4	0.4	0.4	0	0
4.0-4.5	0	0	0	0	0	0	1.8	0.3	0.3	0.3	0	0
3.5-4.0	0	0	0	0	0	1.2	3.0	0.1	0.1	0.1	0	0
3.0-3.5	0	0	0	0	0	6.6	2.3	0	0	0	0	0
2.5-3.0	0	0	0	0	1.1	6.8	1.1	0	0	0	0	0
2.0-2.5	0	0	0	0	13.0	3.5	0.4	0	0	0	0	0
1.5-2.0	0	0	0.1	0.1	8.8	2.2	0.3	0	0	0	0	0
1.0-1.5	0	0	4.6	9.8	1.0	0	0	0	0	0	0	0
.8-1.0	0	0	3.2	2.2	0.4	0	0	0	0	0	0	0
.6-.8	0	0	2.3	2.0	0	0	0	0	0	0	0	0
.5-.6	0	0	4.0	2.0	0.7	0	0	0	0	0	0	0
.4-.5	0	0	4.4	2.0	0.2	0	0	0	0	0	0	0
.3-.4	0.2	0.2	3.9	2.1	0	0	0	0	0	0	0	0
.0-.3	0.3	0.3	0.7	0.5	0	0	0	0	0	0	0	0
<b>TOTAL PERCENTS, ALL FLIGHTS</b>	<b>0.5</b>	<b>23.2</b>	<b>43.4</b>	<b>22.5</b>	<b>9.3</b>	<b>1.0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

(c) Fuel weight at take off

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	10 TO 30 KIAMS	30 TO 50 KIAMS	50 TO 70 KIAMS	70 TO 90 KIAMS	90 TO 110 KIAMS	110 TO 130 KIAMS	130 TO 150 KIAMS	150 TO 170 KIAMS	170 TO 190 KIAMS	190 TO
6.5-7.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0.2	0	0	0	0	0	0	0	0	0
4.5-5.0	0.2	0.5	0	0	0	0	0	0	0	0
4.0-4.5	1.1	1.0	0	0	0	0	0	0	0	0
3.5-4.0	2.3	2.0	0	0	0	0	0	0	0	0
3.0-3.5	4.0	4.8	0	0	0	0	0	0	0	0
2.5-3.0	4.2	4.4	0.4	0	0	0	0	0	0	0
2.0-2.5	11.3	5.0	0.7	0	0	0	0	0	0	0
1.5-2.0	4.6	5.5	1.3	0	0	0	0	0	0	0
1.0-1.5	5.4	9.1	1.0	0	0	0	0	0	0	0
.8-1.0	1.4	3.8	0.5	0	0	0	0	0	0	0
.6-.8	1.1	2.5	0.7	0	0	0	0	0	0	0
.5-.6	1.6	3.6	0.9	0.5	0	0	0	0	0	0
.4-.5	1.0	4.4	1.0	0.2	0	0	0	0	0	0
.3-.4	1.1	3.7	1.4	0	0	0	0	0	0	0
.0-.3	0.3	0.7	0.5	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS		39.8	51.0	8.4	0.8	0	0	0	0	0

(d) Fuel weight at landing

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	0 TO 20 KIAMS	20 TO 40 KIAMS	40 TO 60 KIAMS	60 TO 80 KIAMS	80 TO 100 KIAMS	100 TO 120 KIAMS	120 TO 140 KIAMS	140 TO 160 KIAMS	160 TO 180 KIAMS	180 TO 190 KIAMS
6.5-7.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0.2	0	0	0
4.5-5.0	0	0	0	0	0	0.5	0.2	0	0	0
4.0-4.5	0	0	0	0	0	2.0	0.1	0	0	0
3.5-4.0	0	0	0	0.8	3.5	0	0	0	0	0
3.0-3.5	0	0	0	7.9	1.0	0	0	0	0	0
2.5-3.0	0	0	0.7	8.3	0	0	0	0	0	0
2.0-2.5	0	0	13.7	3.3	0	0	0	0	0	0
1.5-2.0	0	0	11.3	0.1	0	0	0	0	0	0
1.0-1.5	5.9	9.5	0	0	0	0	0	0	0	0
.8-1.0	5.7	0.1	0	0	0	0	0	0	0	0
.6-.8	4.3	0	0	0	0	0	0	0	0	0
.5-.6	6.7	0	0	0	0	0	0	0	0	0
.4-.5	6.6	0	0	0	0	0	0	0	0	0
.3-.4	6.2	0	0	0	0	0	0	0	0	0
.0-.3	1.5	0	0	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	36.9	35.2	20.4	7.0	0.5	0	0	0	0	0

(e) Fuel burn vs flight duration

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	0 TO 20 KIABS	20 TO 40 KIABS	40 TO 60 KIABS	60 TO 80 KIABS	80 TO 100 KIABS	100 TO 120 KIABS	120 TO 140 KIABS	140 TO 160 KIABS	160 TO 180 KIABS	180 TO
6.5-7.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0.2	0	0	0	0	0	0	0	0
4.5-5.0	0.1	0.3	0.3	0	0	0	0	0	0	0
4.0-4.5	0.2	0.8	1.0	0.1	0	0	0	0	0	0
3.5-4.0	0	0.9	2.3	1.1	0	0	0	0	0	0
3.0-3.5	0.1	2.4	4.0	2.3	0	0	0	0	0	0
2.5-3.0	0.1	2.4	3.9	2.5	0	0	0	0	0	0
2.0-2.5	1.8	5.0	6.7	3.5	0	0	0	0	0	0
1.5-2.0	1.1	3.7	4.9	1.6	0	0	0	0	0	0
1.0-1.5	1.4	4.6	5.4	4.0	0	0	0	0	0	0
.8-1.0	0.4	2.0	3.2	0.2	0	0	0	0	0	0
.6-.8	1.3	1.5	1.1	0.3	0	0	0	0	0	0
.5-.6	2.8	1.8	1.8	0.3	0	0	0	0	0	0
.4-.5	2.6	2.6	1.2	0.1	0	0	0	0	0	0
.3-.4	2.8	2.5	0.8	0.1	0	0	0	0	0	0
.0-.3	1.1	0.2	0.2	0	0	0	0	0	0	0
<b>TOTAL PERCENTS, ALL FLIGHTS</b>	<b>16.0</b>	<b>31.0</b>	<b>36.8</b>	<b>16.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

(I) Payload weight vs flight duration.

Figure 3.- Concluded.

PRESSURE ALTITUDE BANDS									
GROSS WEIGHT KLBBS		-500 TO 4500 FT		4500 TO 9500 FT		9500 TO 14500 FT		14500 TO 19500 FT	
***CLIMB***									
250-270	0	0	0.00917	0.0056	0.0026	0.0006	0	0	0
270-290	0.0163	0	0.1176	0.1110	0.0812	0.0547	0.0447	0.0499	0.0413
290-310	0.1037	0	0.3059	0.3629	0.3093	0.2991	0.3770	0.4765	0.2901
310-330	0.2683	0	0.4321	0.5335	0.4886	0.5379	0.6953	0.8288	0.4155
330-350	0.4056	0	0.4645	0.5076	0.6480	0.6441	0.8088	1.1113	1.4090
350-370	0.3895	0	0.4014	0.4882	0.4780	0.6133	0.8607	1.0575	0.2857
370-390	0.2076	0.1971	0.2363	0.2370	0.2925	0.3668	0.3950	0.3950	0.0342
390-410	0.0381	0.0371	0.0441	0.0320	0.0367	0.0279	0.0157	0	0
410-430									0.2316
PERCENT TOTAL TIME =	1.8937	2.0084	2.4296	2.2726	2.6436	3.4838	4.2324	1.7384	0.0169
AVE GROSS WEIGHT IN ALTITUDE BAND	355.78	354.74	355.71	357.25	360.05	360.54	359.83	351.19	308.23
***LEVEL***									
250-270	0	0	0.1229	0.0305	0.0081	0	0	0	0
270-290	0.0493	0	0.2475	0.2592	0.0722	0.1831	0.1105	0.0804	0.0692
290-310	0.2012	0	0.3934	0.6388	0.2421	0.1971	0.3003	0.6058	1.7220
310-330	0.3938	0	0.3632	0.4346	0.4546	0.2157	0.2765	0.4818	0.4818
330-350	0.0659	0	0.0807	0.1402	0.0763	0.1035	0.1035	0.4437	2.1031
350-370	0	0	0.0201	0.0222	0	0.0045	0.0045	0.1727	3.7598
370-390	0	0.0016	0.0055	0.0014	0	0.0011	0	0.0882	1.1293
390-410	0	0.0012	0	0	0	0	0	0.1727	0
410-430								0.7742	0.5306
PERCENT TOTAL TIME =	1.0751	1.3059	1.5269	0.6145	0.7769	1.5160	10.4763	43.3707	0.1751
AVE GROSS WEIGHT IN ALTITUDE BAND	323.75	322.92	325.60	329.11	327.62	343.26	362.44	346.29	301.53
***DESCENT***									
250-270	0	0	0.1166	0.0487	0.0294	0	0	0.0218	0
270-290	0.2089	0	0.6147	0.4338	0.2600	0.2120	0.2045	0.1718	0.1069
290-310	0.9501	0	1.6165	1.1890	0.6359	0.5453	0.5677	0.5078	0.2760
310-330	1.6165	1	1.2241	1.0400	0.7301	0.6966	0.7383	0.7115	0.2451
330-350	1.5097	0	0.2113	0.2584	0.2216	0.2430	0.2725	0.3072	0.0856
350-370	0.2186	0	0.0023	0.0025	0.0019	0.0115	0.0115	0.0257	0.0186
370-390	0	0	0	0	0	0	0	0.0009	0.0009
390-410	0	0	0	0	0	0	0	0	0
410-430	0								
PERCENT TOTAL TIME =	4.4038	3.3580	2.7577	1.8769	1.7238	1.8194	1.7509	0.7483	0.0026
AVE GROSS WEIGHT IN ALTITUDE BAND	323.08	324.80	327.49	329.16	330.75	331.83	333.45	329.03	285.62
HOURS IN ALTITUDE & CLIMB (LEVEL, DESCENT) & GROSS WEIGHT BANDS									
PERCENT TIME =									
TOTAL FLIGHTS								914	
TOTAL TIME								1619.24	
TOTAL AIRMILES								708383.64	
TOTAL TIME, HOURS									
X 1.00									

Figure 4.- Percent time in altitude and gross weight bands.

CAS BAND, KTS	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS TOTAL HOURS
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT	
120-130	0	0	0	0	0	0	0	0	0	0	0
130-140	0	0	0	0	0	0	0	0	0	0	0
140-150	0.0001	0	0	0	0	0	0	0	0	0	0.0001
150-160	0.0014	0.0003	0.0001	0	0	0	0	0	0	0	0.0018
160-170	0.0111	0.0111	0.004	0	0	0	0	0	0	0	0.0126
170-180	0.0647	0.0028	0.0003	0	0	0	0	0	0	0	0.0678
180-190	0.1742	0.0048	0.0003	0	0	0	0	0	0	0	0.1792
190-200	0.2351	0.0045	0.0003	0	0	0	0	0	0	0	0.2398
200-210	0.2121	0.0077	0.0043	0.0017	0	0	0	0	0	0	0.2257
210-220	0.2222	0.0144	0.0032	0.0007	0	0	0	0	0	0	0.2475
220-230	0.2565	0.0350	0.0040	0.0007	0	0	0	0.0006	0	0	0.2968
230-240	0.1894	0.0875	0.0102	0.0031	0.0008	0.0006	0.0011	0	0	0	0.2926
240-250	0.1855	0.4576	0.0980	0.0096	0.0024	0.0014	0.0016	0.0015	0.0015	0.0015	0.7650
250-260	0.1952	0.7525	0.2293	0.0170	0.0040	0.0038	0.0057	0.0057	0.0057	0.0122	1.2966
260-270	0.0582	0.1889	0.1632	0.0126	0.0047	0.0033	0.0231	0.3653	0.0331	0.8225	0
270-280	0.0242	0.0654	0.1602	0.0295	0.0132	0.0118	0.1180	0.7650	0	0	1.1872
280-290	0.0153	0.0446	0.1962	0.0830	0.0791	0.0936	0.7517	0.4611	0	0	1.7245
290-300	0.0143	0.0831	0.5243	0.7714	0.9290	1.2477	1.7773	0.621	0	0	5.4092
300-310	0.0165	0.1335	0.6549	0.8712	1.0971	1.5036	1.3085	0.0006	0	0	5.5859
310-320	0.0071	0.0644	0.1914	0.2392	0.2831	0.3620	0.2172	0	0	0	1.3644
320-330	0.0031	0.0249	0.0811	0.1005	0.1112	0.1429	0.0266	0	0	0	0.4903
330-340	0.0005	0.0136	0.0441	0.0514	0.0532	0.0699	0.0011	0	0	0	0.2339
340-350	0	0.0338	0.0328	0.0415	0.0426	0.0382	0	0	0	0	0.1689
350-360	0	0.0079	0.0225	0.0323	0.0226	0.0045	0	0	0	0	0.0899
360-370	0	0.0002	0.0070	0.0072	0.0008	0.0002	0	0	0	0	0.0154
370-380	0	0	0.0014	0.0003	0	0	0	0	0	0	0.0018
380-390	0	0	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0	0	0
AV CAS	222.1913	261.9649	291.8472	303.6753	304.1234	303.6186	296.7216	275.2610	255.9756		
TOTAL HRS IN ALT. & CLIMB	30.6635	32.5208	39.3414	36.7997	42.8065	56.4105	68.5331	28.1487	0.2733	335.4975	
PERCENT TIME IN ALT. & CLIMB	1.8937	2.0084	2.4296	2.2726	2.6436	3.4838	4.2324	1.7384	0.0169	20.7194	
										914	
										1619.2	

(a) Climb

Figure 5.- Percent time in altitude and airspeed bands.

PRESSURE ALTITUDE BANDS									
CAS BAND KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT
120-130	0.0001	0	0	0	0	0	0	0	0
130-140	0.0011	0.0002	0	0	0	0	0	0	0
140-150	0.00105	0.0017	0	0	0	0	0	0	0.0122
150-160	0.0741	0.0032	0.0010	0	0	0	0	0	0.0784
160-170	0.1836	0.0230	0.0007	0	0	0	0	0	0.2073
170-180	0.1564	0.0439	0.0078	0	0	0	0	0	0.2080
180-190	0.1307	0.0395	0.0053	0	0	0	0	0	0.1755
190-200	0.0516	0.0169	0.0036	0	0	0	0	0	0.0721
200-210	0.0539	0.0939	0.0242	0.0002	0	0	0	0	0.1722
210-220	0.0700	0.1691	0.1152	0.0010	0	0	0	0	0.3554
220-230	0.0541	0.0752	0.0817	0.0011	0.0067	0	0	0	0.2229
230-240	0.0510	0.0645	0.0689	0.0025	0.0583	0.0135	0.0026	0.0165	0.2779
240-250	0.0641	0.2159	0.1361	0.0125	0.0126	0.0103	0.0039	0.0502	0.5119
250-260	0.0792	0.2874	0.1978	0.0138	0.0253	0.0096	0.0014	0.2037	0.1684
260-270	0.0234	0.1047	0.1048	0.0049	0.0092	0.0056	0.0034	3.1522	0.0004
270-280	0.0113	0.0293	0.0768	0.0037	0.0138	0.0045	0.0168	15.0436	0
280-290	0.0092	0.0210	0.0753	0.0062	0.0061	0.0063	0.0482	12.2956	0
290-300	0.0085	0.0253	0.0770	0.0127	0.0093	0.0144	0.0929	12.6007	0
300-310	0.0071	0.0201	0.0879	0.0122	0.0170	0.0310	6.6572	0.0041	0
310-320	0.0057	0.0145	0.0960	0.0147	0.0303	0.0820	2.2265	0	2.4698
320-330	0.0113	0.0102	0.0918	0.0355	0.0547	0.4939	0.6232	0	1.3207
330-340	0.0114	0.0137	0.0789	0.0821	0.1047	0.5902	0.0002	0	0.8812
340-350	0.0064	0.0139	0.0816	0.1437	0.1626	0.1791	0	0	0.5872
350-360	0	0.0163	0.0666	0.1881	0.1817	0.0698	0	0	0.2226
360-370	0	0.0024	0.0446	0.0778	0.0827	0.0057	0	0	0.2131
370-380	0	0	0.0033	0.0017	0.0020	0	0	0	0
380-390	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0
AV CAS	204.1130	242.0146	279.7108	338.9914	327.6451	329.2281	307.2635	282.7732	254.6688
TOTAL HRS IN ALT. & LEVEL	17.4081	21.1458	24.7247	9.9497	12.5792	24.5475	169.6369	702.2781	2.8350
PERCENT TIME IN ALT. & LEVEL	1.0751	1.3059	1.5269	0.6145	0.7769	1.5160	10.4763	43.3707	0.1751
								TOTAL FLIGHTS TOTAL HOURS	985.1050 1619.2
									914 1619.2

(b) Level

Figure 5.- Continued.

## PRESSURE ALTITUDE BANDS

CAS BAND KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0.0105	0.0009	0	0	0	0	0	0	0	0.0115
130-140	0.02221	0.0076	0	0	0	0	0	0	0	0.2297
140-150	0.8841	0.0128	0	0	0	0	0	0	0	0.8970
150-160	0.8058	0.0339	0.0021	0	0	0	0	0	0	0.8418
160-170	0.5278	0.0976	0.0043	0	0	0	0	0	0	0.6298
170-180	0.3724	0.1697	0.0135	0	0	0	0	0	0	0.5557
180-190	0.2995	0.1762	0.0211	0	0	0	0	0	0	0.4968
190-200	0.1979	0.1382	0.0172	0.0004	0	0	0	0	0	0.3537
200-210	0.1789	0.2093	0.0391	0.0008	0	0	0	0	0	0.4280
210-220	0.1887	0.3161	0.0822	0.0068	0	0.0029	0	0	0	0
220-230	0.1289	0.2039	0.0479	0.0152	0	0.0071	0.0008	0.0013	0	0.4049
230-240	0.1149	0.2058	0.0680	0.0229	0	0.0181	0.0049	0.0031	0	0.4378
240-250	0.1522	0.5026	0.2034	0.0404	0	0.0350	0.0190	0.0043	0.0011	0.9574
250-260	0.1170	0.6136	0.2629	0.0803	0	0.0339	0.0209	0.0066	0.0111	1.1484
260-270	0.0334	0.1313	0.1011	0.0193	0	0.0165	0.0161	0.0177	0.0658	0.0005
270-280	0.0243	0.0563	0.0821	0.0214	0	0.0148	0.0161	0.0284	0.1287	0
280-290	0.0252	0.0469	0.0809	0.0344	0	0.0247	0.0201	0.0557	0.2634	0
290-300	0.0224	0.0385	0.1000	0.0870	0	0.0637	0.0457	0.1956	0.2382	0
300-310	0.0184	0.0394	0.1317	0.0799	0	0.0767	0.0661	0.4186	0.0400	0
310-320	0.0199	0.0437	0.1366	0.0687	0	0.0646	0.0941	0.4617	0.0001	0.8894
320-330	0.0184	0.0523	0.1641	0.0916	0	0.0655	0.1980	0.3941	0	0.9840
330-340	0.0202	0.0676	0.2276	0.1505	0	0.1125	0.4107	0.1557	0	1.1447
340-350	0.0160	0.0926	0.3207	0.2920	0	0.2314	0.4843	0.0081	0	1.4452
350-360	0.0045	0.0706	0.3782	0.4606	0	0.4040	0.3109	0	0	1.6289
360-370	0.0002	0.0295	0.2544	0.3793	0	0.5002	0.0994	0	0	1.2630
370-380	0	0.0014	0.0183	0.0275	0	0.0501	0.0122	0	0	0.1095
380-390	0	0	0	0	0	0.0002	0	0	0	0.0003
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	179.8910	240.3053	304.3755	333.4549	339.8685	334.8912	311.8291	285.2743	257.0915	
TOTAL HRS IN ALT. & DESCENT	71.3083	54.3736	44.6533	30.4234	27.9122	29.4510	28.3508	12.1172	0.0425	298.6423
PERCENT TIME IN ALT. & DESCENT	4.4038	3.3580	2.7577	1.8789	1.7238	1.8194	1.7509	0.7483	0.0026	18.4433
								TOTAL FLIGHTS TOTAL HOURS	914 1619.2	

(c) Descent

Figure 5.- Continued.

PRESSURE ALTITUDE BANDS										
CAS BAND	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0.0107	0.0009	0	0	0	0	0	0	0	0.0116
130-140	0.2232	0.0079	0	0	0	0	0	0	0	0.2310
140-150	0.8948	0.0145	0.0001	0	0	0	0	0	0	0.9093
150-160	0.8812	0.0375	0.0033	0	0	0	0	0	0	0.9220
160-170	0.7226	0.1217	0.0054	0	0	0	0	0	0	0.8497
170-180	0.5935	0.2165	0.0216	0	0	0	0	0	0	0.8315
180-190	0.6044	0.2205	0.0267	0	0	0	0	0	0	0.8516
190-200	0.4846	0.1596	0.0212	0.0004	0	0	0	0	0	0.6657
200-210	0.4448	0.3109	0.0675	0.0027	0	0	0	0	0	0.8260
210-220	0.4879	0.4997	0.2007	0.0084	0.0029	0	0	0	0	1.1996
220-230	0.4396	0.3141	0.1336	0.0170	0.0137	0.0008	0.0019	0.0040	0	0.9247
230-240	0.3553	0.3578	0.1471	0.0285	0.0772	0.0191	0.0668	0.0165	0	1.0083
240-250	0.4018	1.1755	0.4375	0.0625	0.0501	0.0307	0.0098	0.0587	0.0077	2.2343
250-260	0.3914	1.6335	0.6901	0.1111	0.0632	0.0343	0.0137	0.2916	0.1127	3.4317
260-270	0.1151	0.4249	0.3692	0.0367	0.0303	0.0251	0.0442	3.5834	0.0001	4.6330
270-280	0.0599	0.1510	0.3191	0.0546	0.037	0.0324	0.1632	15.9372	0	16.7611
280-290	0.0497	0.1126	0.3524	0.1235	0.1098	0.1200	0.8556	13.0201	0	14.7438
290-300	0.0453	0.1469	0.7013	0.8710	1.0020	1.3007	2.8657	12.9010	0	19.8410
300-310	0.0420	0.1930	0.8745	0.9633	1.1907	1.6008	8.3842	0.0447	0	13.2932
310-320	0.3227	0.1227	0.4240	0.3226	0.3780	0.5382	2.9054	0.0001	0	4.7235
320-330	0.0328	0.0874	0.3370	0.2276	0.2315	0.8349	1.0439	0	0	2.7950
330-340	0.0322	0.0949	0.3507	0.2839	0.2704	1.0708	0.1570	0	0	2.2598
340-350	0.0224	0.1203	0.4351	0.4771	0.4366	0.7016	0.0081	0	0	2.2013
350-360	0.0046	0.0948	0.4674	0.6810	0.6003	0.3853	0	0	0	2.2414
360-370	0.0002	0.0321	0.3060	0.4643	0.5836	0.1053	0	0	0	1.4915
370-380	0	0.0014	0.0230	0.0296	0.0520	0.0122	0	0	0	0.1183
380-390	0	0	0	0	0	0.0002	0	0	0	0.0003
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	194.2882	247.1595	294.2328	319.9683	319.6600	317.6557	305.0384	282.5293	254.8149	
TOTAL HRS IN ALTITUDE BAND	119.3799	108.0403	108.7194	77.1728	83.2978	110.4190	266.5208	742.5439	3.1508	1619.2448
PERCENT TIME, IN ALTITUDE BAND	7.3726	6.6723	6.7142	4.7660	5.1442	6.8192	16.4596	45.8574	0.1946	100.0000
TOTAL FLIGHTS									914	
TOTAL HOURS									1619.2	

(d) All flight modes

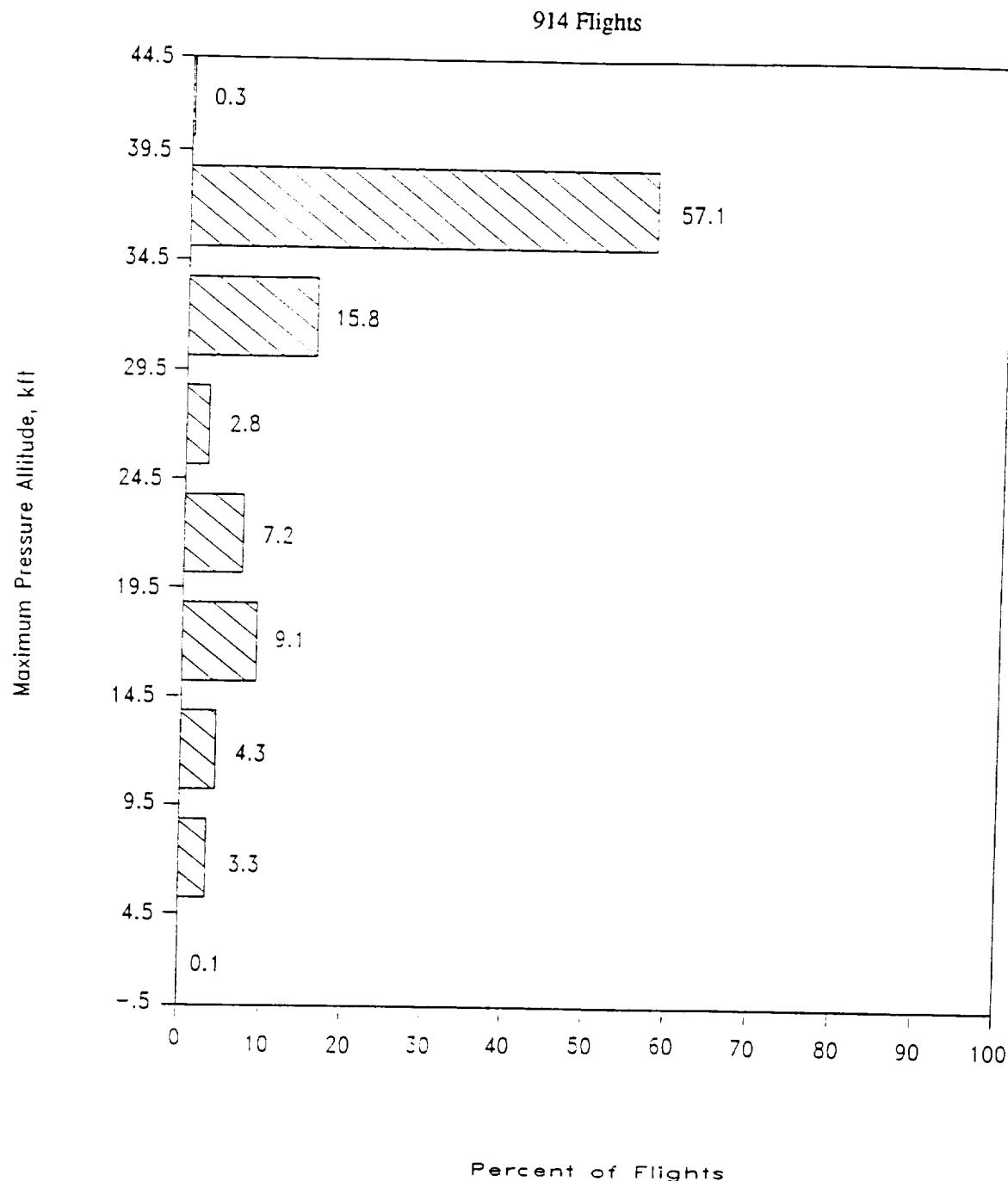
Figure 5.- Concluded.

Figure 6.- Percent of flights that spend indicated time in pressure altitude bands.

DURATION OF FLIGHT, HOURS	-500 TO 4500 FT			4500 TO 9500 FT			9500 TO 14500 FT			14500 TO 19500 FT			19500 TO 24500 FT			24500 TO 29500 FT			29500 TO 34500 FT			34500 TO 39500 FT			39500 TO 44500 FT			
	4500 FT	9500 FT	14500 FT	9500 FT	14500 FT	19500 FT	14500 FT	19500 FT	24500 FT	19500 FT	24500 FT	19500 FT	24500 FT	29500 FT	24500 FT	29500 FT	34500 FT	29500 FT	34500 FT	39500 FT	34500 FT	39500 FT	44500 FT	34500 FT	39500 FT	44500 FT		
6.5-7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5-5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.0-4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.0-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.5-3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.0-2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.0-1.5	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.8-1.0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.6-.8	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.5-.6	0	0	0	0	0	0	0	0.2	0	0.1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.4-.5	0	0	0	0	0.7	0.7	1.3	3.7	0.9	0.9	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.3-.4	0	0	1.5	2.3	2.4	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.0-.3	0.1	1.0	0.4	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PERCENT ALL FLIGHTS	0.1	3.3	4.3	9.1	7.2	2.8	15.8	57.1	0.3	2.8	15.8	57.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

(a) Maximum altitude vs flight duration - matrix

Figure 7.- Percent of flights to maximum pressure altitude.



(b) Percent of flights to maximum pressure altitude per flight : plot

Figure 7.- Concluded.

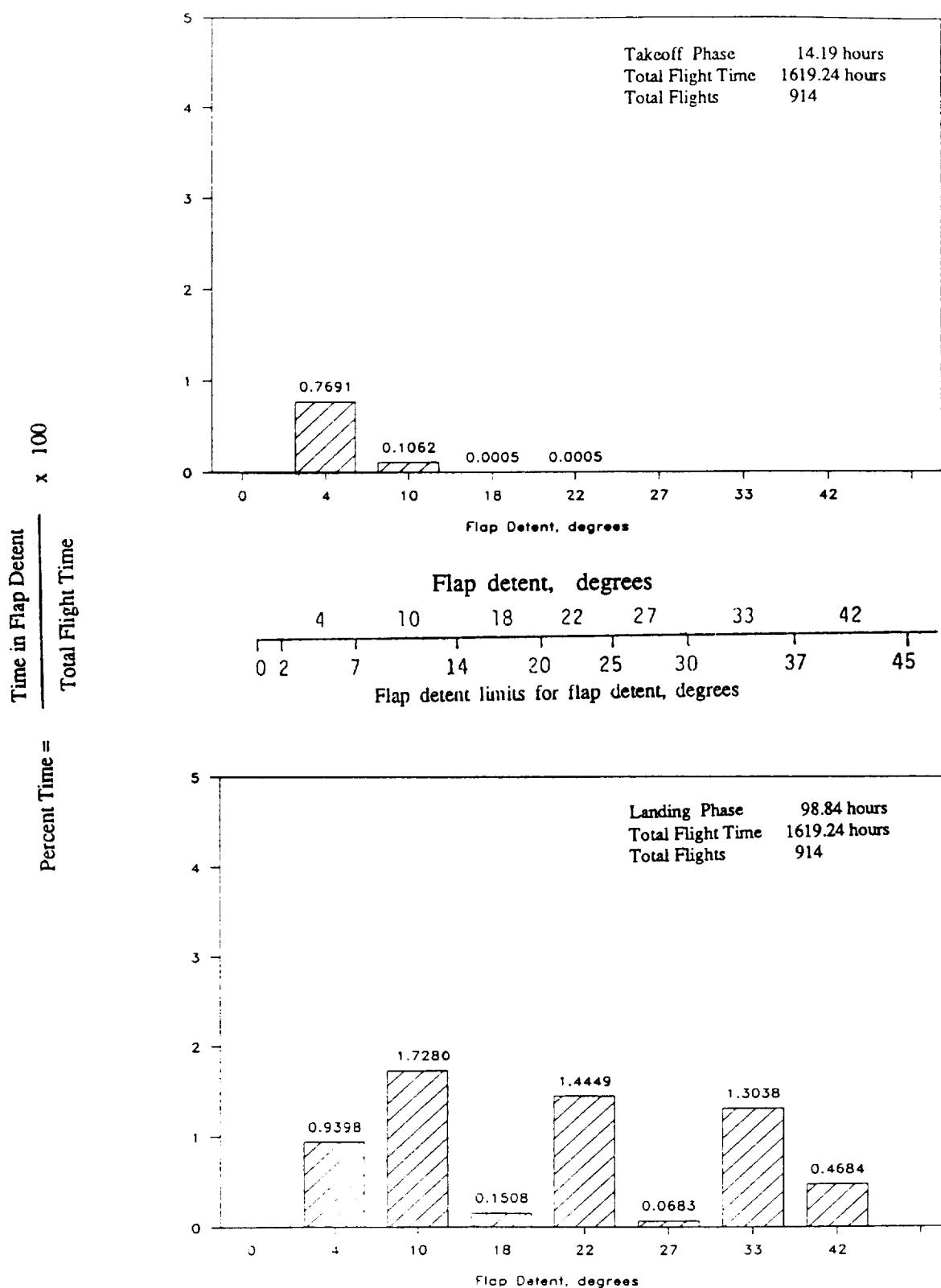
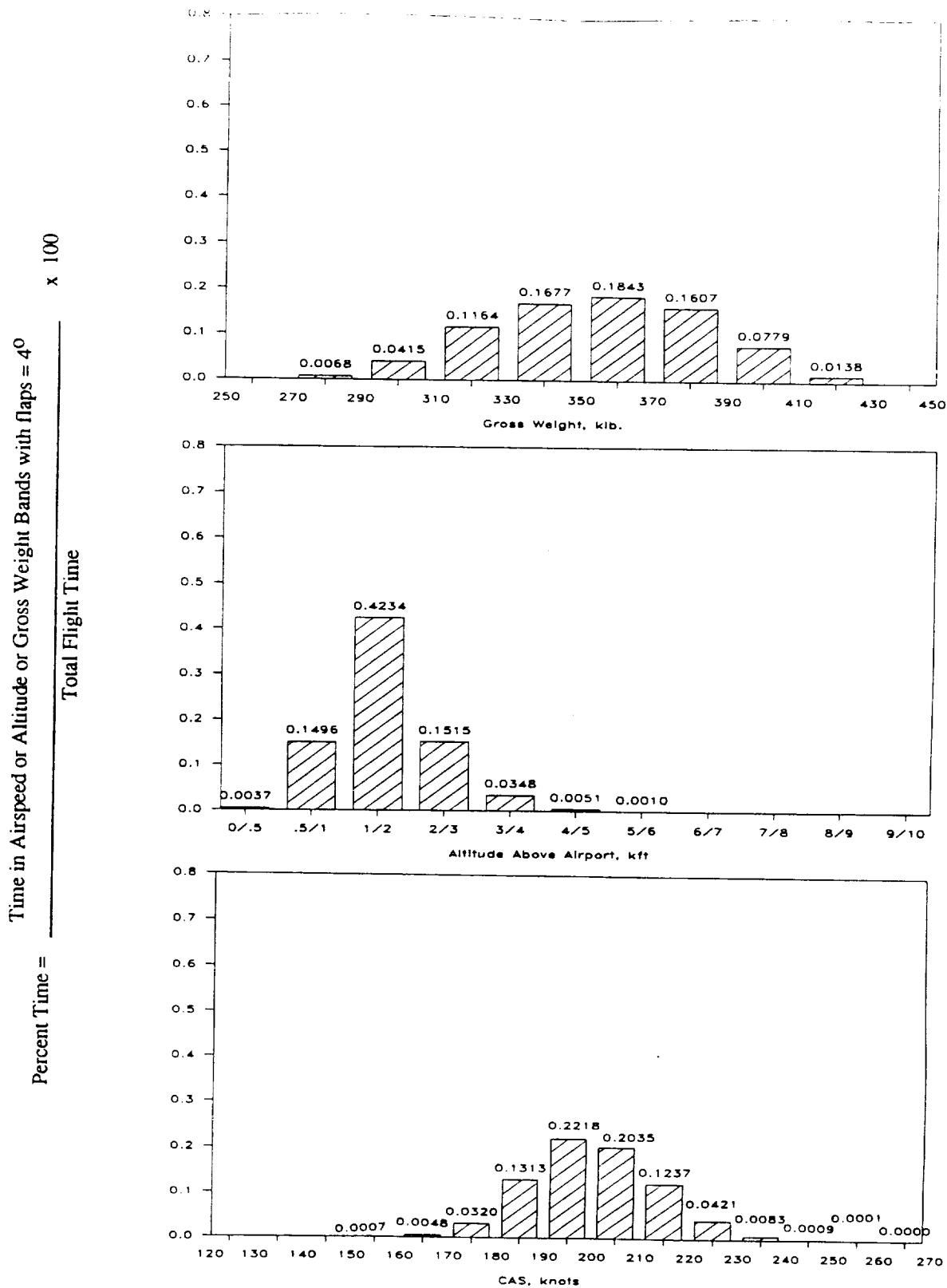
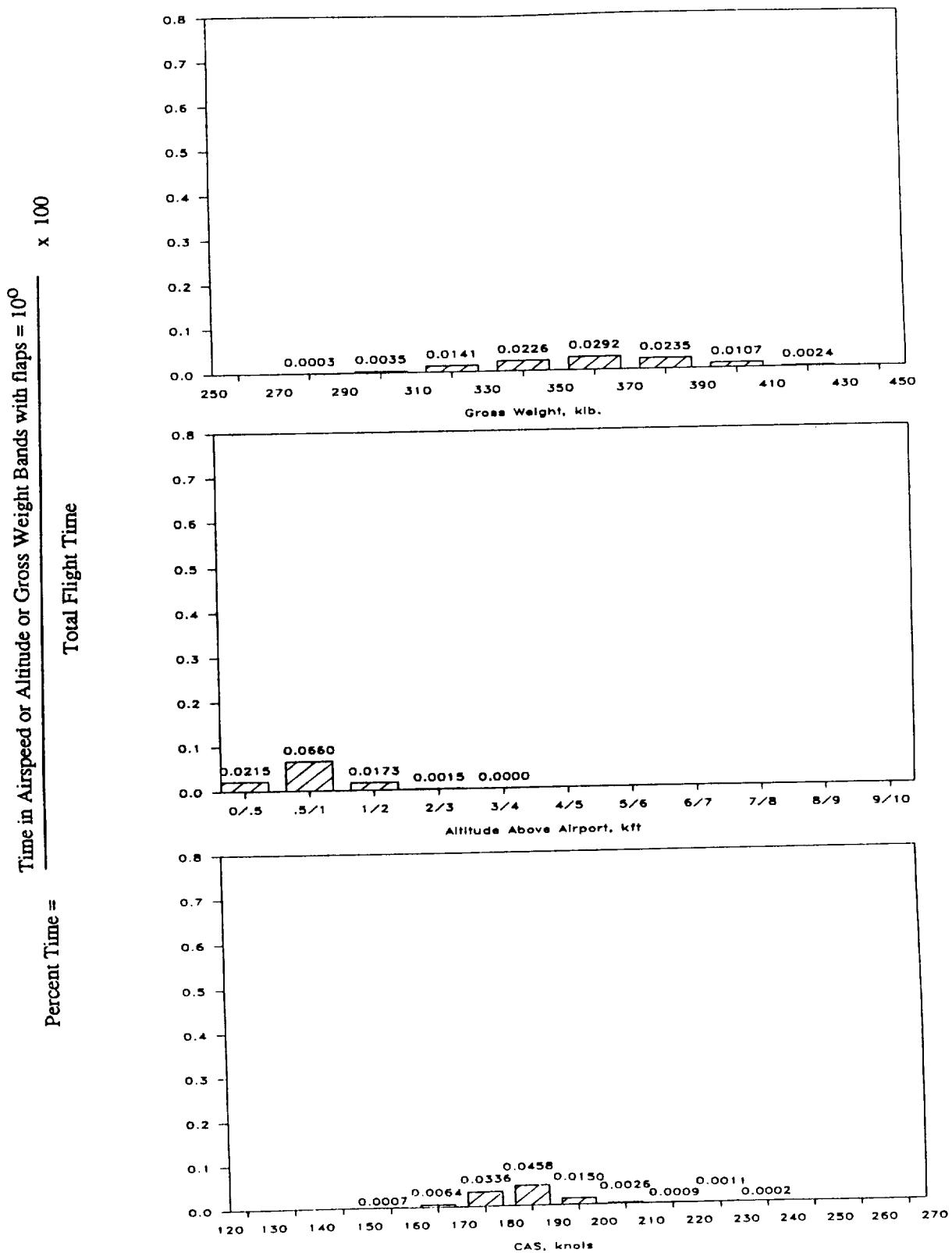


Figure 8.- Percent of total flight time at each flap detent.



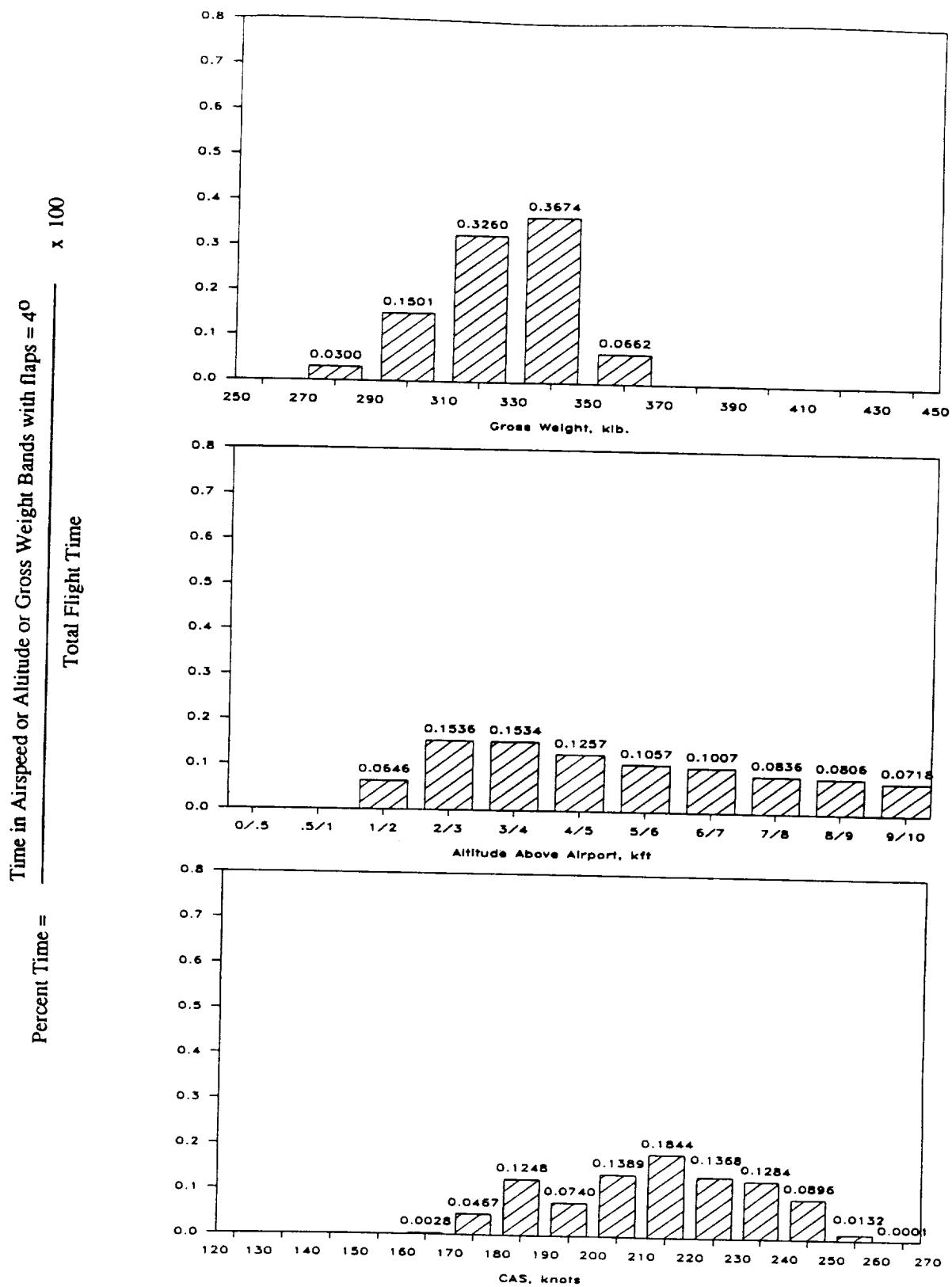
(a) Take off, flaps = 4<sup>0</sup>; 12.4544 hours

Figure 9.- Gross weight, altitude above airport, and airspeed percent time distributions.



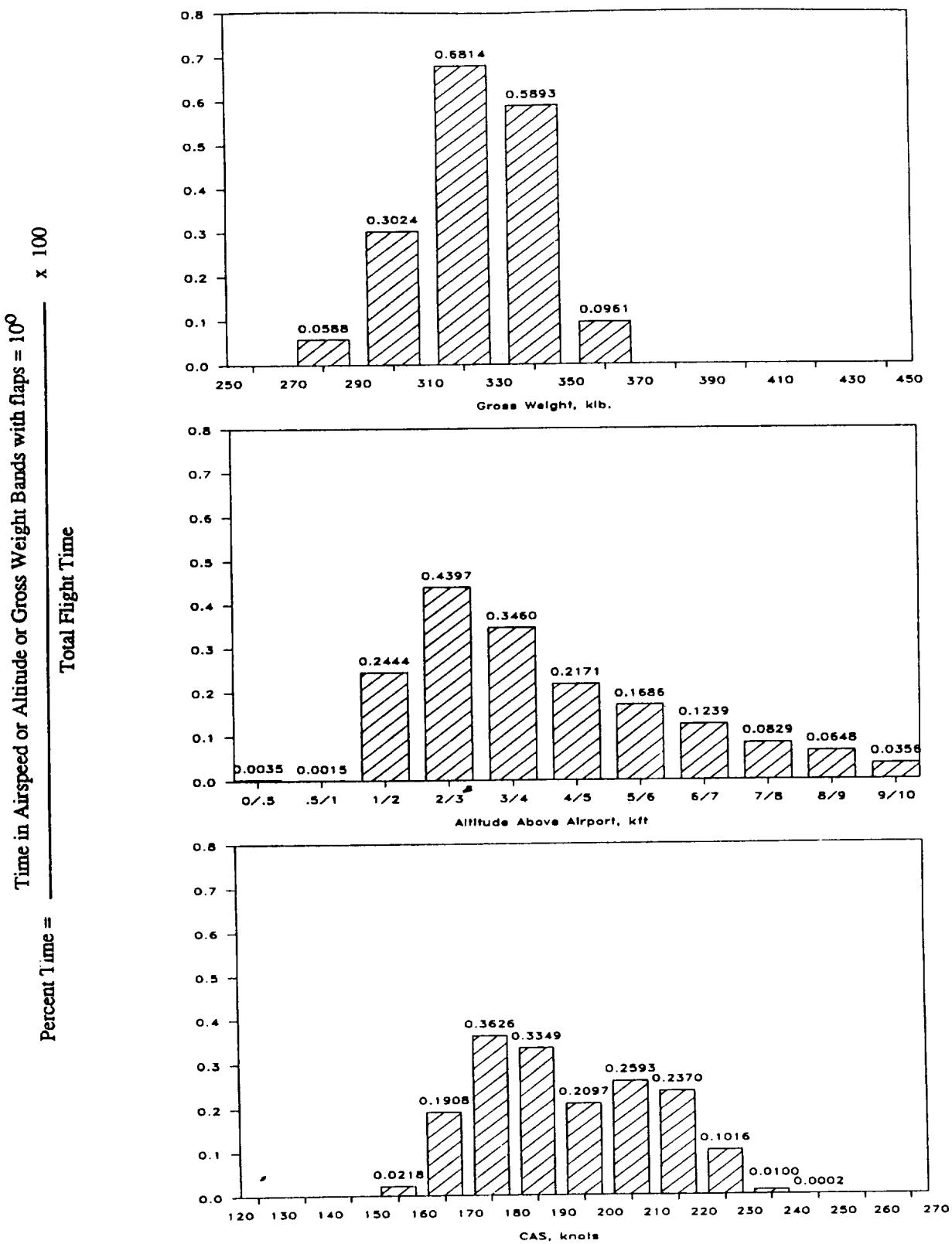
(b) Take off, flaps =  $10^0$ ; 1.7203 hours

Figure 9. - Continued.



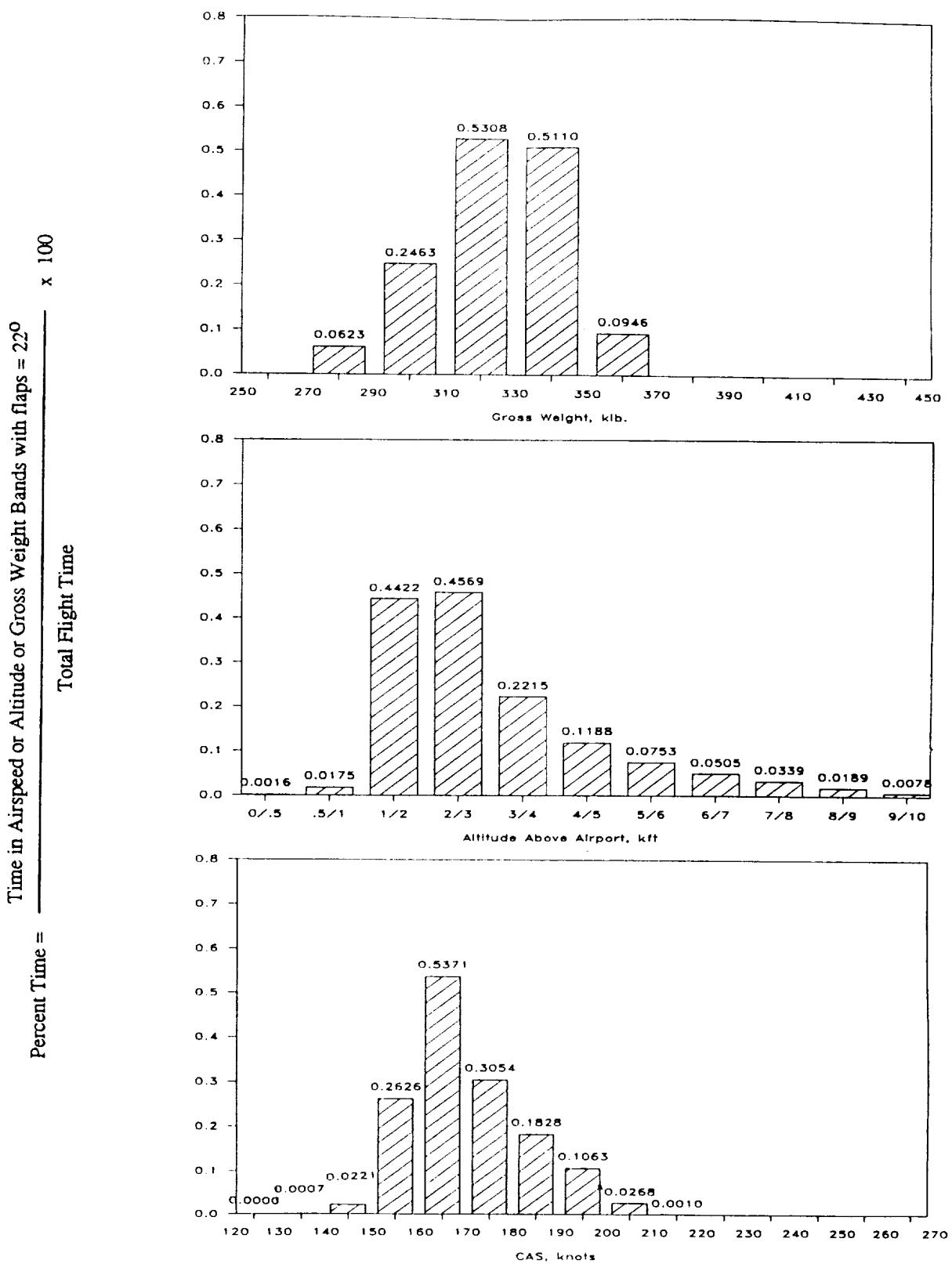
(c) Landing, flaps = 4°; 15.2172 hours

Figure 9. - Continued.



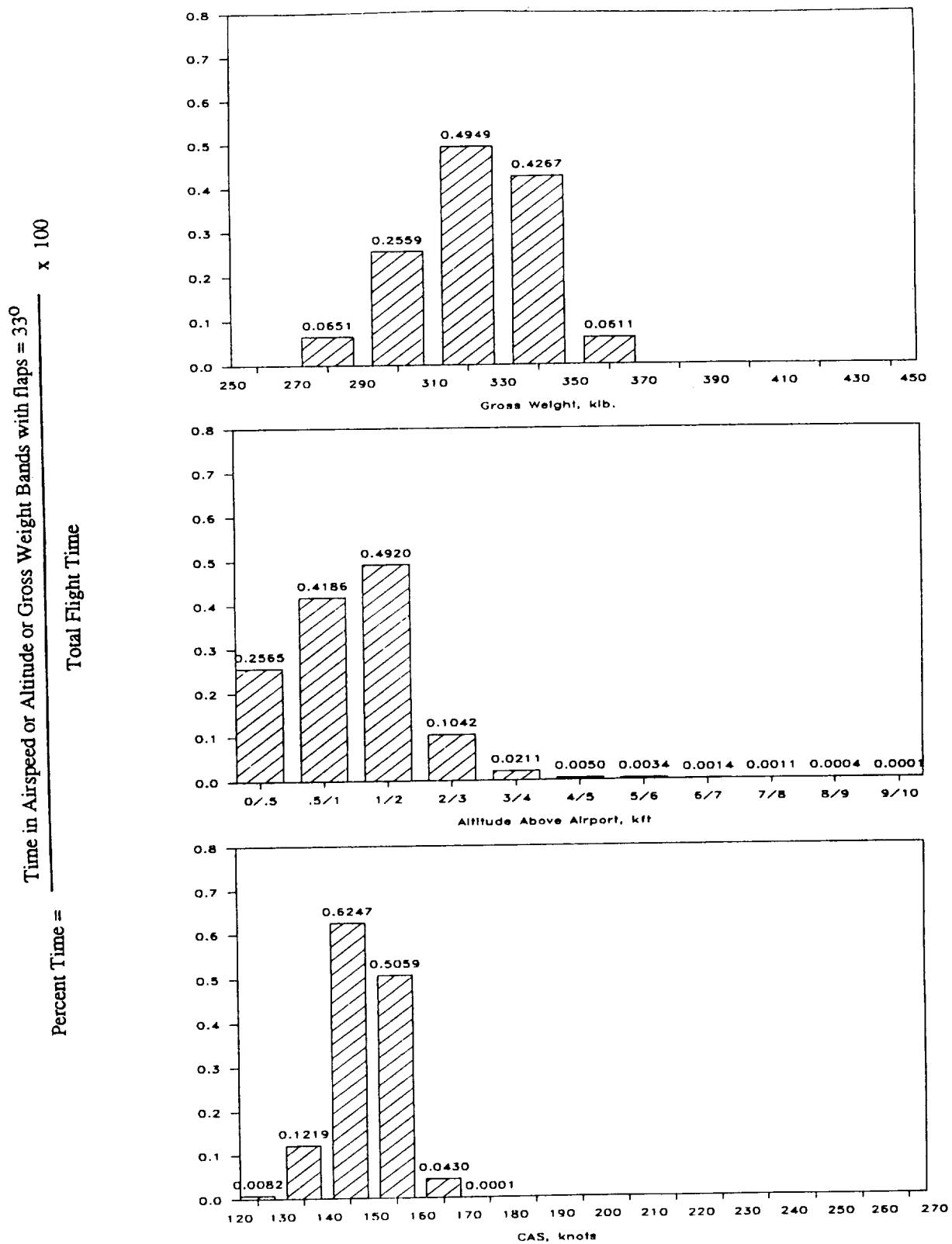
(d) Landing, flaps =  $10^0$ ; 27.9800 hours

Figure 9. - Continued.



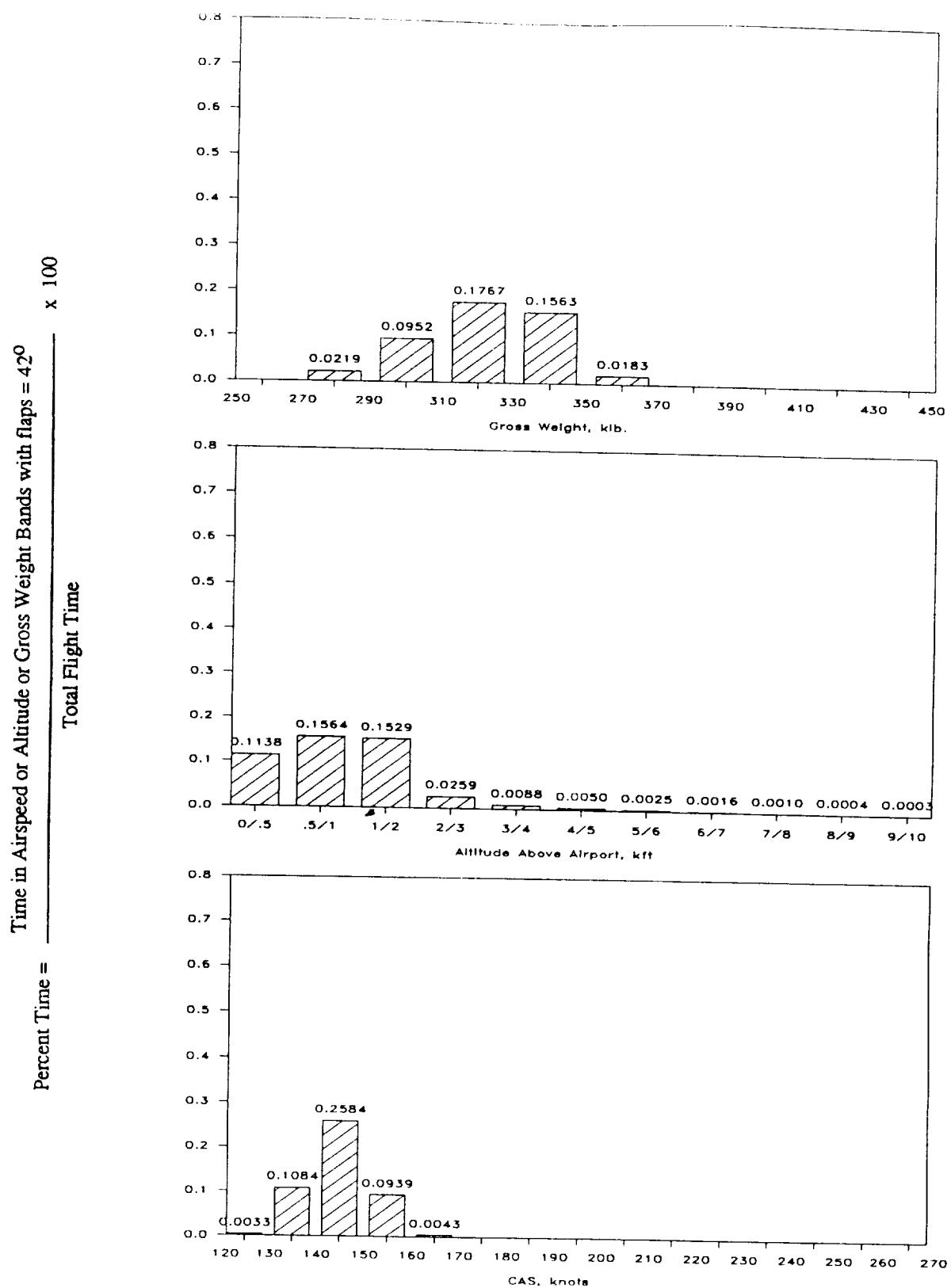
(e) Landing, flaps =  $22^0$ ; 23.3960 hours

Figure 9. - Continued.



(f) Landing, flaps = 33°; 21.1119 hours

Figure 9. - Continued.



(g) Landing, flaps =  $42^0$ ; 7.5845 hours

Figure 9. - Concluded.

## FLAP DEFLECTION, DEGREES

TIME AFTER LIFTOFF MINUTES	30.0	25.0	20.0	14.0	7.0	2.0
0.0 - .1	0	0	0.1	0.2	46.4	0
.1 - .2	0	0	0.1	0	23.1	0
.2 - .3	0	0	0.1	0.1	7.3	1.3
.3 - .4	0	0	0	0.2	2.4	1.3
.4 - .5	0	0	0	0	1.4	6.8
.5 - .6	0	0	0	0	0.9	7.9
.6 - .8	0	0	0	0	1.0	26.5
.8 - 1.0	0	0	0	0	0.2	22.5
1.0 - 1.2	0	0	0	0	0	14.2
1.2 - 1.4	0	0	0	0	0	7.9
1.4 - 1.6	0	0	0	0	0.1	6.0
1.6 - 1.8	0	0	0	0	0	2.4
1.8 - 2.0	0	0	0	0	0	2.0
2.0 - 2.2	0	0	0	0	0	0.2
2.2 - 2.4	0	0	0	0	0	0.3
2.4 - 2.6	0	0	0	0	0	0.3
2.6 - 2.8	0	0	0	0	0	0.1
2.8 - 3.0	0	0	0	0	0	0
3.0 - 3.5	0	0	0	0	0	0
3.5 - 4.0	0	0	0	0	0	0
4.0 - 4.5	0	0	0	0	0	0
4.5 - 5.0	0	0	0	0	0	0
5.0 - 6.0	0	0	0	0	0	0
6.0 - 7.0	0	0	0	0	0	0
7.0 - 8.0	0	0	0	0	0	0
8.0 - 9.0	0	0	0	0	0	0
9.0 - 10.0	0	0	0	0	0	0
10.0 - 15.0	0	0	0	0	0	0
15.0 - 20.0	0	0	0	0	0	0
20.0 - 25.0	0	0	0	0	0	0
0.0 - 25.0	0	0	0.5	0.5	82.8	99.9

## Notes:

1. 914 flights
2. The first 15 seconds after liftoff for each flight are not included.
3. Flap deflections less than 2 degrees were considered to be zero.

(a) Takeoff: Percent of flights vs times when takeoff flap deflection is reduced to less than indicated values

Figure 10.- Flap deflection times.

FLAP DEFLECTIONS, DEGREES

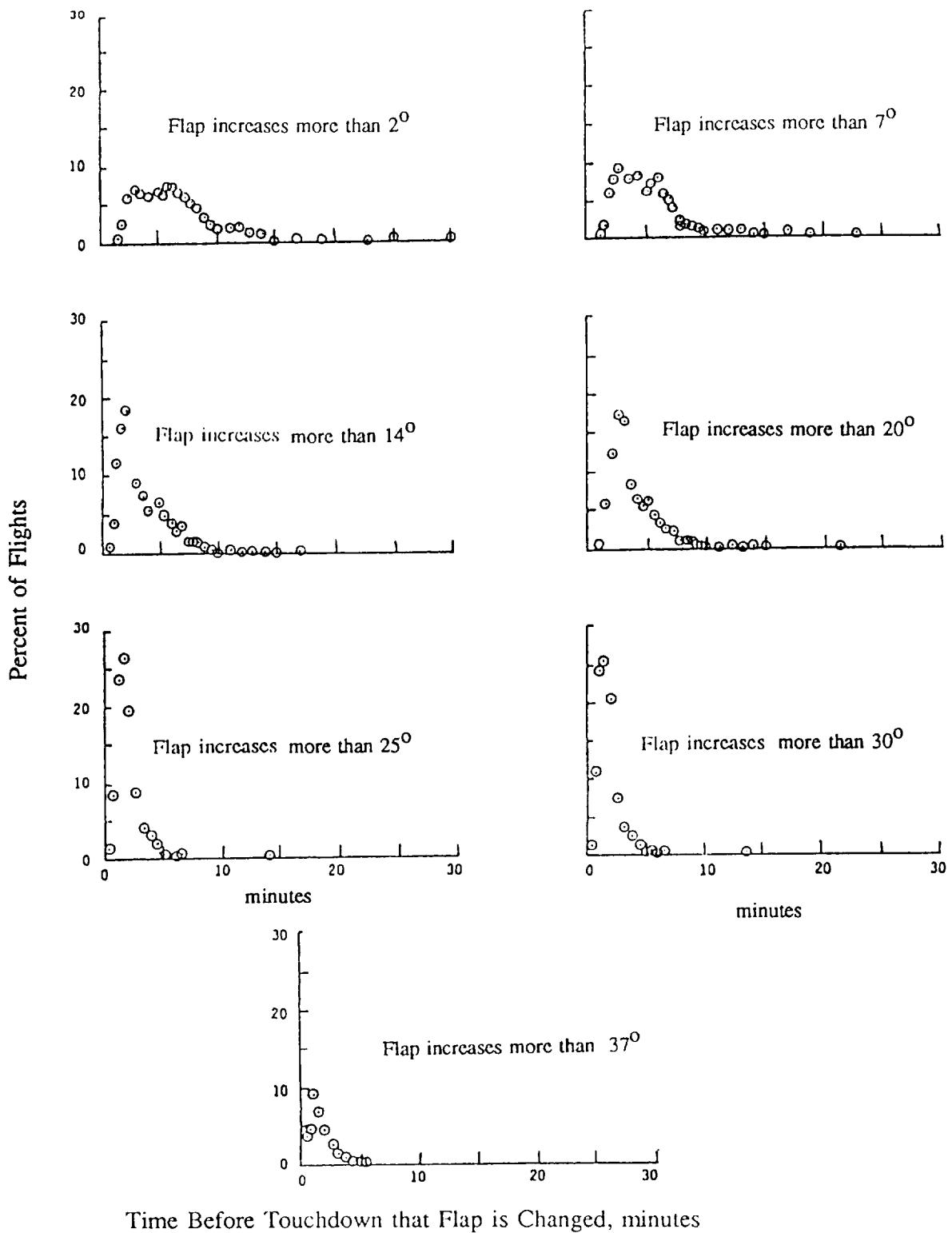
TIME BEFORE TOUCHDOWN MINUTES	2.0	7.0	14.0	20.0	25.0	30.0	37.0
0.0 - .5	0	0	0	0	0	0	3.9
.5 - 1.0	0	0	0.8	0.8	1.1	10.4	4.7
1.0 - 1.5	0	0	0.4	4.0	5.9	23.4	9.0
1.5 - 2.0	0.7	2.0	11.5	12.3	26.9	25.5	6.5
2.0 - 2.5	2.4	6.3	16.2	17.6	19.7	20.5	4.8
2.5 - 3.0	5.7	8.1	17.3	16.7	8.9	7.5	2.3
3.0 - 3.5	6.8	9.6	9.1	8.4	3.9	3.6	1.1
3.5 - 4.0	6.3	8.0	7.1	6.8	3.0	2.5	1.0
4.0 - 4.5	5.9	8.5	5.7	5.7	2.1	1.8	0.3
4.5 - 5.0	6.9	6.7	6.9	6.3	0.4	0.4	0.2
5.0 - 5.5	6.6	7.5	4.5	4.4	0.5	0.5	0.1
5.5 - 6.0	7.0	8.2	3.6	3.2	0.3	0.2	0
6.0 - 6.5	6.8	5.8	2.8	2.7	0.7	0.7	0
6.5 - 7.0	6.8	5.1	3.0	2.6	0	0	0
7.0 - 7.5	6.0	4.6	1.3	1.0	0	0	0
7.5 - 8.0	5.0	3.3	1.3	1.4	0	0	0
8.0 - 8.5	4.8	3.5	1.3	1.2	0	0	0
8.5 - 9.0	3.5	2.2	1.0	0.9	0	0	0
9.0 - 9.5	3.4	1.5	0.5	0.3	0	0	0
9.5 - 10.0	2.1	1.8	0.2	0.3	0	0	0
10.0 - 11.0	2.2	1.6	0.5	0.3	0	0	0
11.0 - 12.0	2.3	1.3	0.3	0.4	0	0	0
12.0 - 13.0	1.9	1.5	0.2	0.1	0	0	0
13.0 - 14.0	1.6	0.3	0.2	0.2	0.1	0.1	0
14.0 - 15.0	0.5	0.4	0.1	0.1	0	0	0
15.0 - 17.0	0.8	0.7	0.1	0	0	0	0
17.0 - 19.0	0.4	0.3	0	0	0	0	0
19.0 - 21.0	0	0	0	0.1	0	0	0
21.0 - 23.0	0.1	0.1	0	0	0	0	0
23.0 - 25.0	0	0	0	0	0	0	0
25.0 - 30.0	0.4	0	0	0	0	0	0
30.0 - 35.0	0.1	0	0	0	0	0	0
35.0 - 40.0	0	0	0	0	0	0	0
40.0 - 60.0	0.1	0	0	0	0	0	0
0.0 - 60.0	97.8	99.6	99.7	99.9	99.5	100.0	33.9

NOTES:

1. 914 flights
2. The last 15 seconds before touchdown on each flight are not included.
3. Flap deflections less than 2 degrees were considered to be zero.

(b) Landing: Percent of flights vs. time when landing flap deflection is increased to greater than indicated value

Figure 10.- Continued.



(c) Landing: Plots of data from Figure 10(b)

Figure 10. - Concluded.

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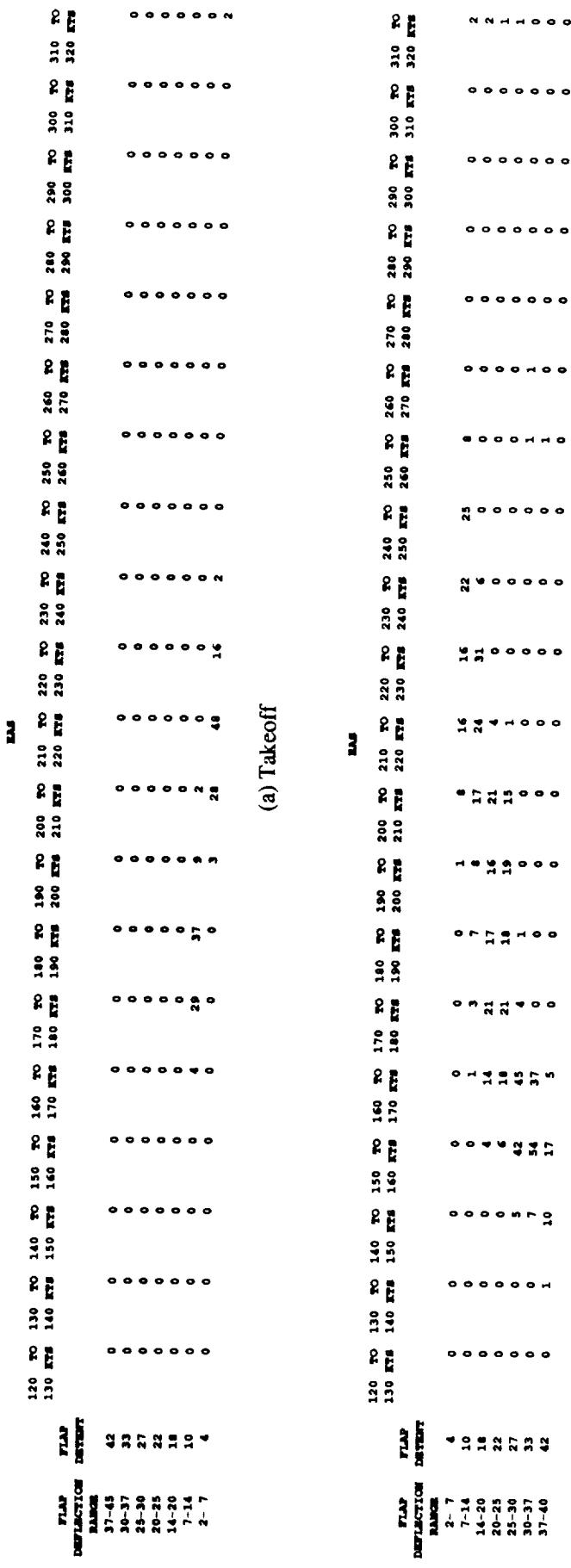


Figure 11.- Percent of flights vs. equivalent airspeed at flap detent change.

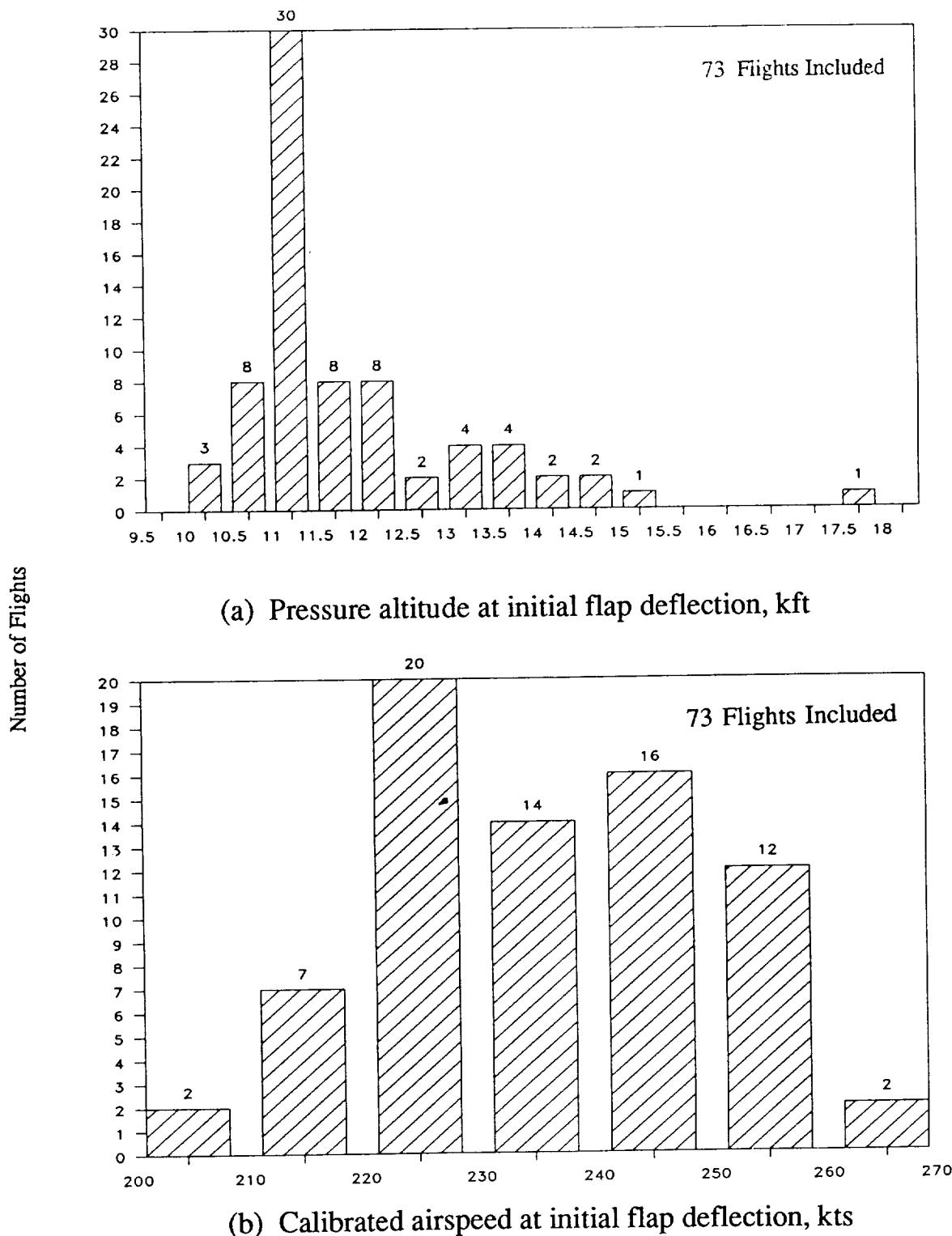
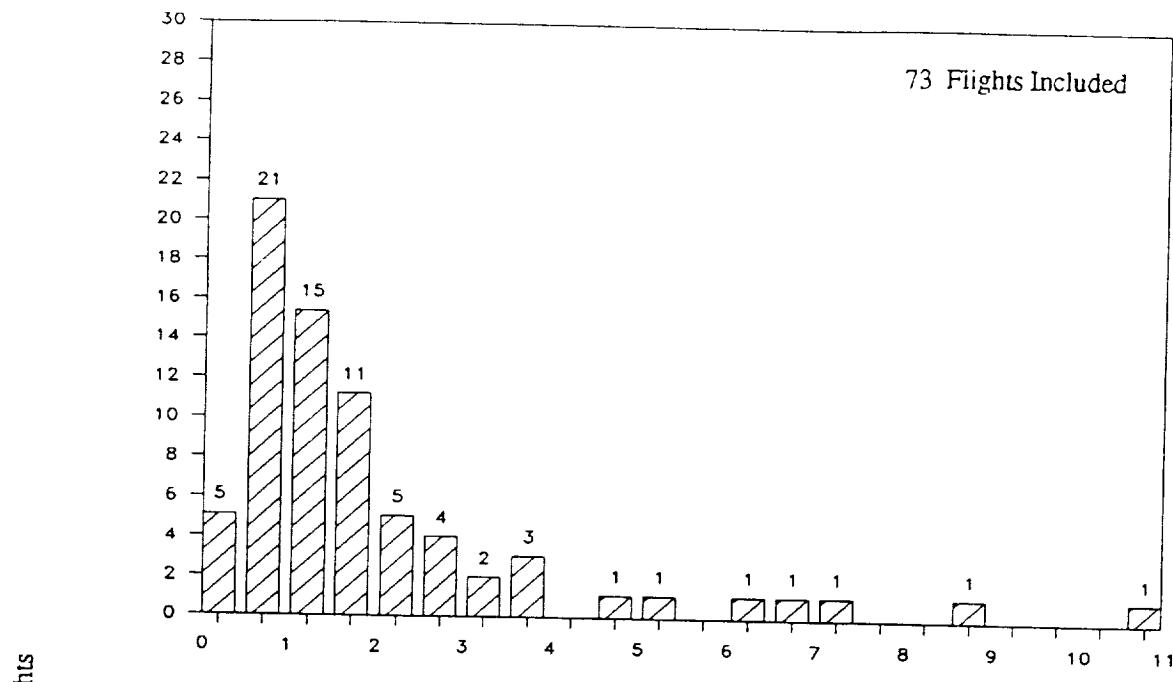
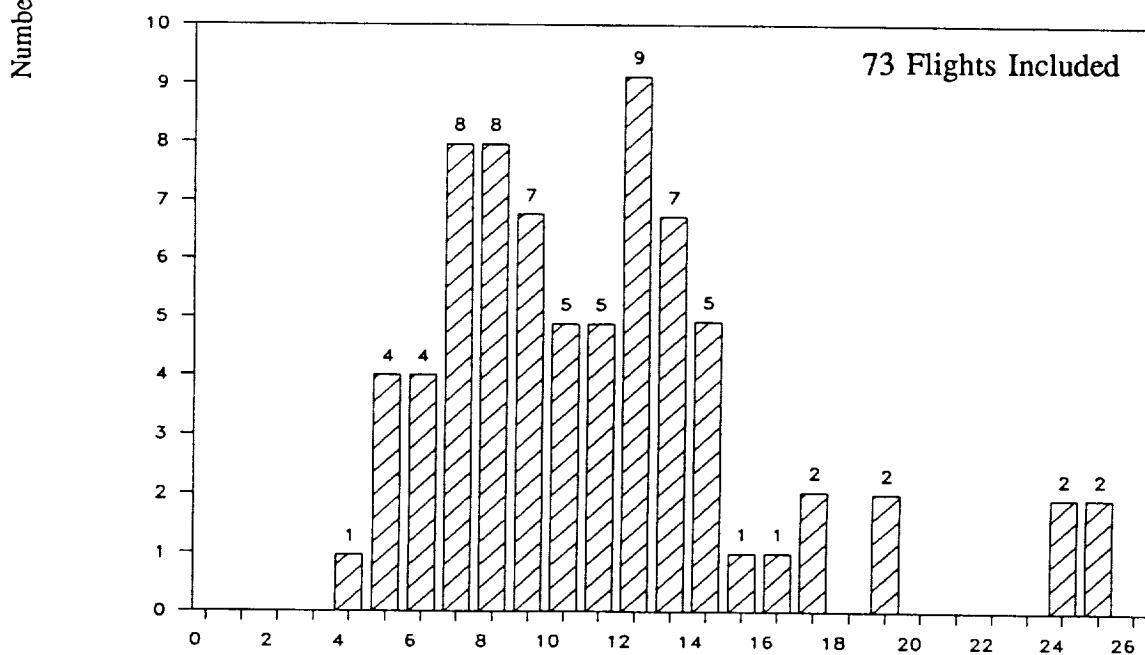


Figure 12.- Flap use above 10,000 feet pressure altitude.



(c) Minutes above 10,000 ft. that flaps deflected  $> 2$  deg



(d) Minutes before touchdown of initial flap deflection

Figure 12.- Concluded.

PRESSURE ALTITUDE BANDS

$a_n$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
LEVEL G'S										
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0.01	0.01	0	0	0	0	0	0	0
.70	0	0.03	0.01	0	0	0	0	0	0	0
.60	0	0.06	0.03	0.01	0	0	0	0	0	0.01
.50	0	0.12	0.10	0.04	0	0	0.02	0	0	0.02
.40	0.13	0.36	0.28	0.17	0.01	0.04	0.01	0.01	0	0.07
.30	1.57	1.37	0.97	0.65	0.24	0.09	0.10	0.03	0	0.35
.20	14.58	9.31	5.89	3.41	1.21	0.80	0.58	0.39	0	2.64
.15	43.58	25.84	15.83	9.58	3.83	2.54	1.82	1.26	0	7.71
.10	140.52	101.17	64.10	35.52	17.95	13.09	8.71	6.70	4.76	29.44
.05	362.38	208.06	194.39	148.89	115.24	92.28	67.91	53.17	70.77	108.65
0.00	865.02	811.63	947.45	1041.56	1123.34	1301.39	1533.91	1677.95	1741.76	1403.05
-.05	283.09	148.22	135.16	122.23	90.73	71.59	57.67	48.77	93.94	87.25
-.10	74.69	39.01	34.15	23.99	13.69	9.82	7.81	6.05	10.47	17.00
-.15	17.14	9.77	8.40	6.26	3.11	1.73	1.61	1.20	0.95	3.87
-.20	4.42	3.36	3.31	2.31	1.06	0.55	0.49	0.35	0.32	1.22
-.30	0.34	0.64	0.55	0.36	0.13	0.02	0.08	0.04	0	0.16
-.40	0.04	0.17	0.14	0.14	0.02	0	0.02	0.01	0	0.04
-.50	0	0.06	0.04	0.06	0	0	0.01	0	0	0.01
-.60	0	0.03	0	0.01	0	0	0.01	0	0	0
-.70	0	0.01	0	0	0	0	0.01	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-.1.00	0	0	0	0	0	0	0	0	0	0
-.1.20	0	0	0	0	0	0	0	0	0	0
-.1.40	0	0	0	0	0	0	0	0	0	0
-.1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60
TOTAL FLIGHTS	914									
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									1619.24	
TOTAL FLIGHT MILES FLAPS UP AND DOWN									708383.60	

(a)  $a_n$  level crossing counts per hour within pressure altitude bands

Figure 13.- Normal acceleration exceedances.

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PRESSURE ALTITUDE BANDS

$a_{nM}$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
LEVEL g's										
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0.01	0	0	0	0	0	0
.30	0.04	0.06	0.06	0.03	0.03	0.01	0	0	0	0.01
.20	1.03	0.69	0.23	0.21	0.06	0.05	0.02	0	0	0.16
.15	4.32	3.22	1.22	0.69	0.38	0.18	0.07	0.02	0	0.70
.10	17.18	15.48	7.49	3.25	1.73	0.52	0.26	0.12	0	3.21
.05	47.74	42.94	32.77	20.53	13.24	8.47	3.71	2.15	1.27	12.42
0.00	153.48	129.03	122.85	119.14	120.15	139.09	165.95	184.68	161.22	161.87
-.05	30.95	26.10	22.35	17.65	11.72	7.01	3.23	2.02	3.17	8.84
-.10	4.15	3.94	3.09	1.98	1.02	0.39	0.21	0.10	0.32	1.03
-.15	0.39	0.43	0.29	0.26	0.12	0.05	0.05	0.01	0	0.11
-.20	0.03	0.06	0.03	0.03	0.01	0.01	0.01	0	0	0.01
-.30	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60
TOTAL FLIGHTS									914	
TOTAL FLIGHT HOURS FLAPS UP AND DOWN										1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN										708383.60

(b)  $a_{nM}$  level crossing counts per hour within pressure altitude bands

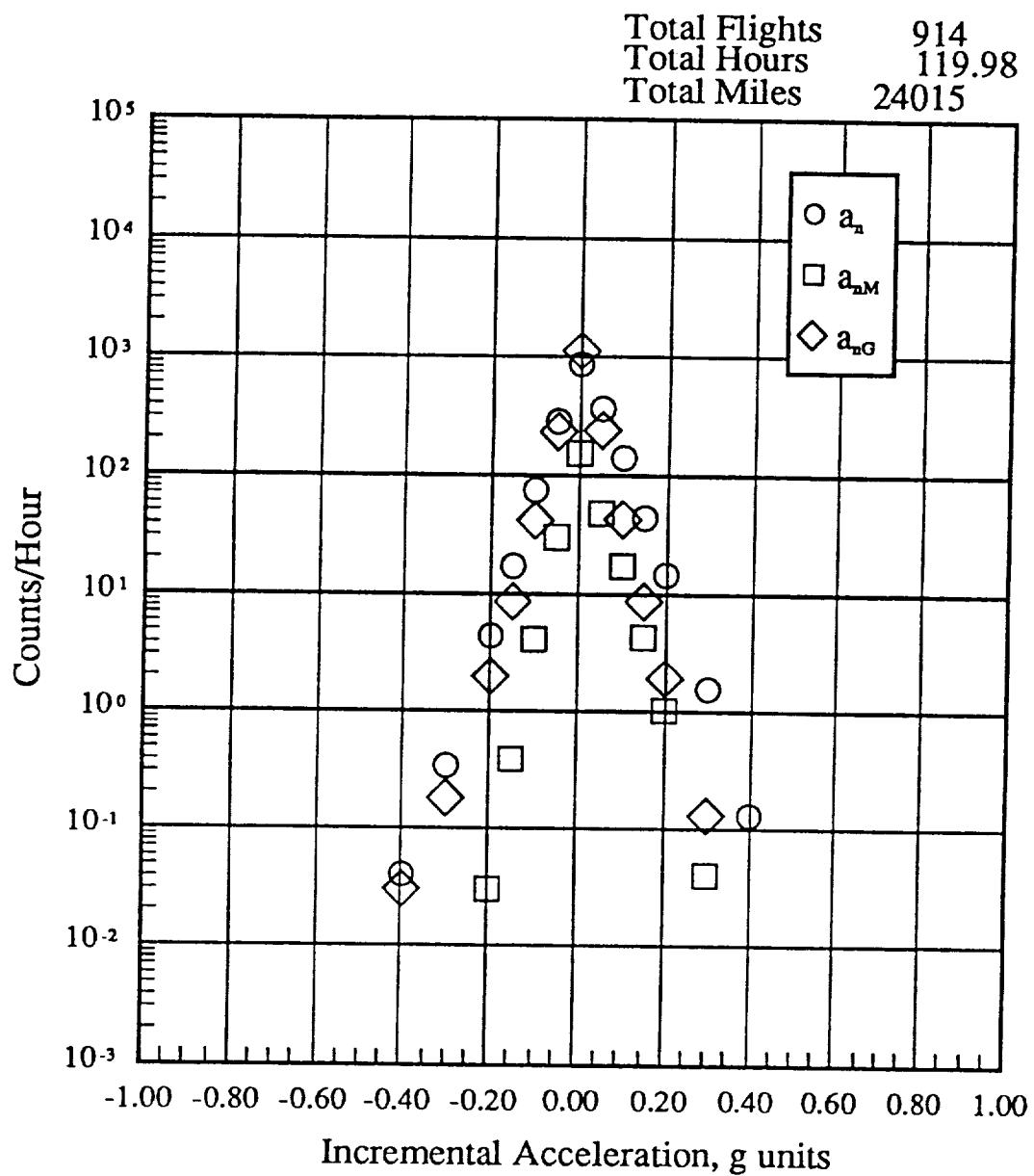
Figure 13.- Continued.

PRESSURE ALTITUDE BANDS

$a_{nG}$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
LEVEL										
g's	0	0	0	0	0	0	0	0	0	0
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0.01	0	0	0	0	0	0
.70	0	0	0.02	0.02	0	0	0	0	0	0
.60	0	0.06	0.03	0.03	0	0	0	0	0	0.01
.50	0	0.14	0.13	0.04	0.01	0	0.01	0	0	0.02
.40	0	0.35	0.40	0.26	0.02	0.01	0.06	0.01	0	0.09
.30	0.13	1.80	1.70	1.10	0.24	0.14	0.20	0.11	0	0.54
.20	1.94	5.00	4.67	2.84	0.95	0.59	0.72	0.51	0	1.87
.15	8.73	17.92	15.35	9.56	4.31	3.29	3.37	2.73	0.95	8.07
.10	42.48	92.41	72.85	50.69	31.24	27.47	27.95	23.90	32.37	50.21
.05	239.27	1205.66	1383.02	1505.45	1602.97	1623.82	1647.05	1651.64	1702.41	1552.74
0	1121.52	94.22	73.75	51.73	32.35	27.29	27.53	23.69	31.74	49.83
-.05	232.50	41.39	17.75	15.44	9.25	4.57	3.31	3.26	2.62	1.27
-.10	8.64	4.98	4.68	2.73	0.92	0.67	0.68	0.45	0	1.82
-.15	1.99	2.02	1.89	1.10	0.18	0.19	0.20	0.10	0	0.56
-.20	0.18	0.45	0.36	0.19	0.02	0	0.03	0.01	0	0.09
-.30	0.03	0.14	0.08	0.05	0	0	0.01	0	0	0.02
-.40	0	0.06	0.03	0.01	0	0	0.01	0	0	0.01
-.50	0	0.01	0	0.01	0	0	0.01	0	0	0
-.60	0	0.01	0	0	0	0	0.01	0	0	0
-.70	0	0.01	0	0	0	0	0.01	0	0	0
-.80	0	0.01	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.10	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	77.17	83.30	110.42	266.52	742.54	3.15	1619.24	
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52244.52	131363.92	363808.53	1545.14	708383.60
TOTAL FLIGHTS								914		
TOTAL FLIGHT HOURS									1619.24	
TOTAL FLIGHT MILES									708383.60	
FLIGHTS UP AND DOWN										
FLIGHTS DOWN AND UP										

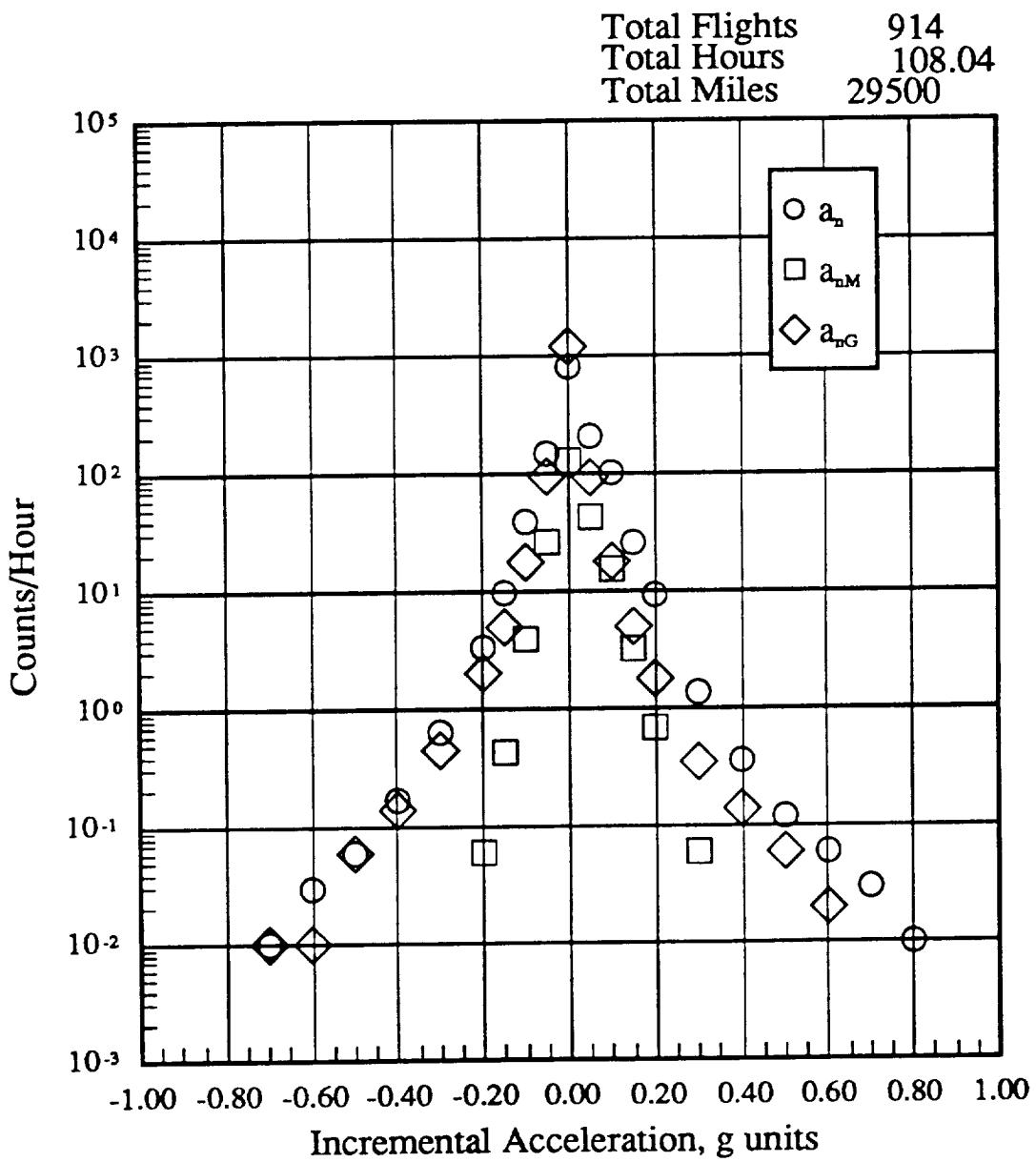
(c)  $a_{nG}$  level crossing counts per hour within pressure altitude bands

Figure 13.- Continued.



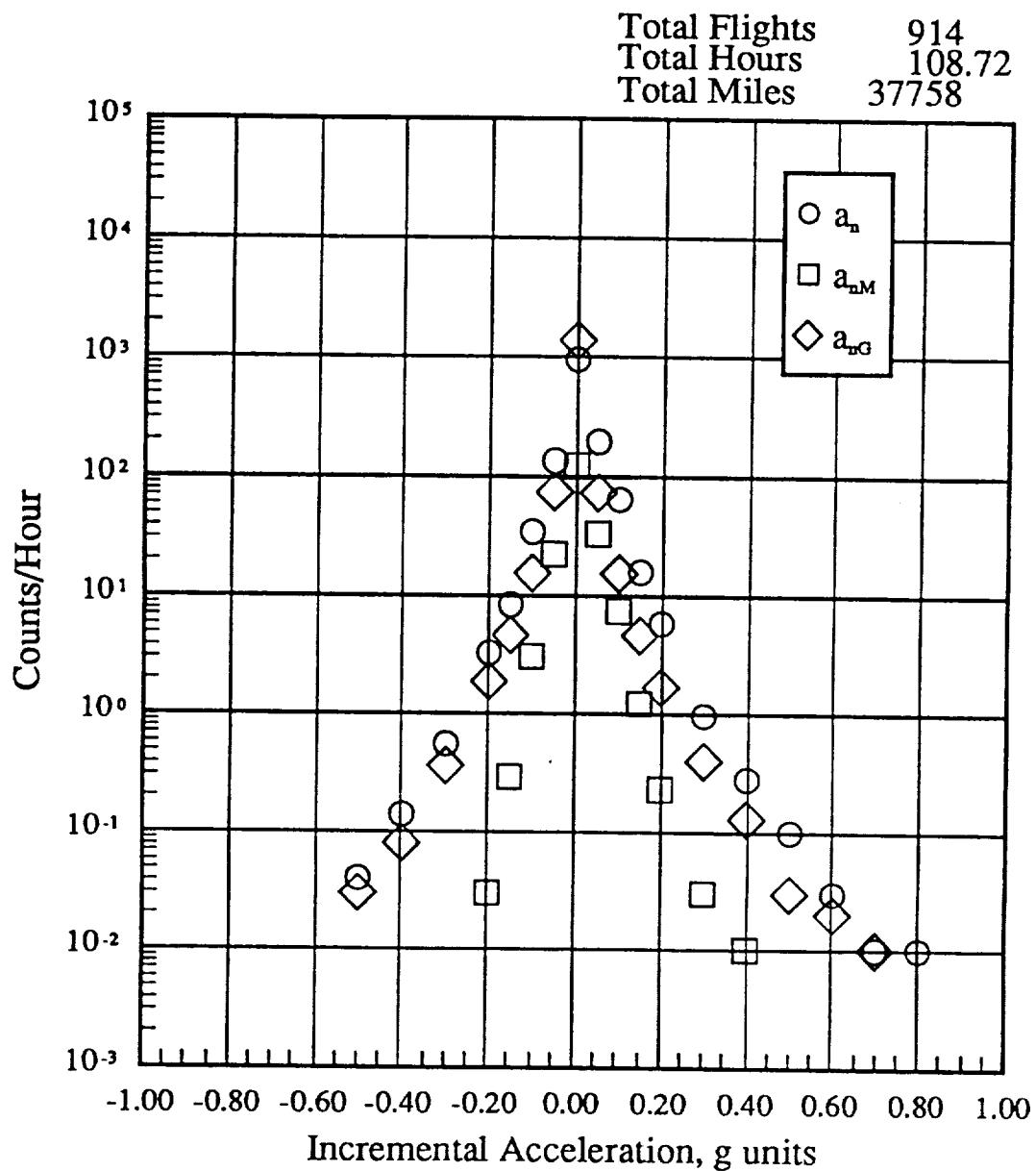
(d)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 4500 feet altitude

Figure 13.- Continued.



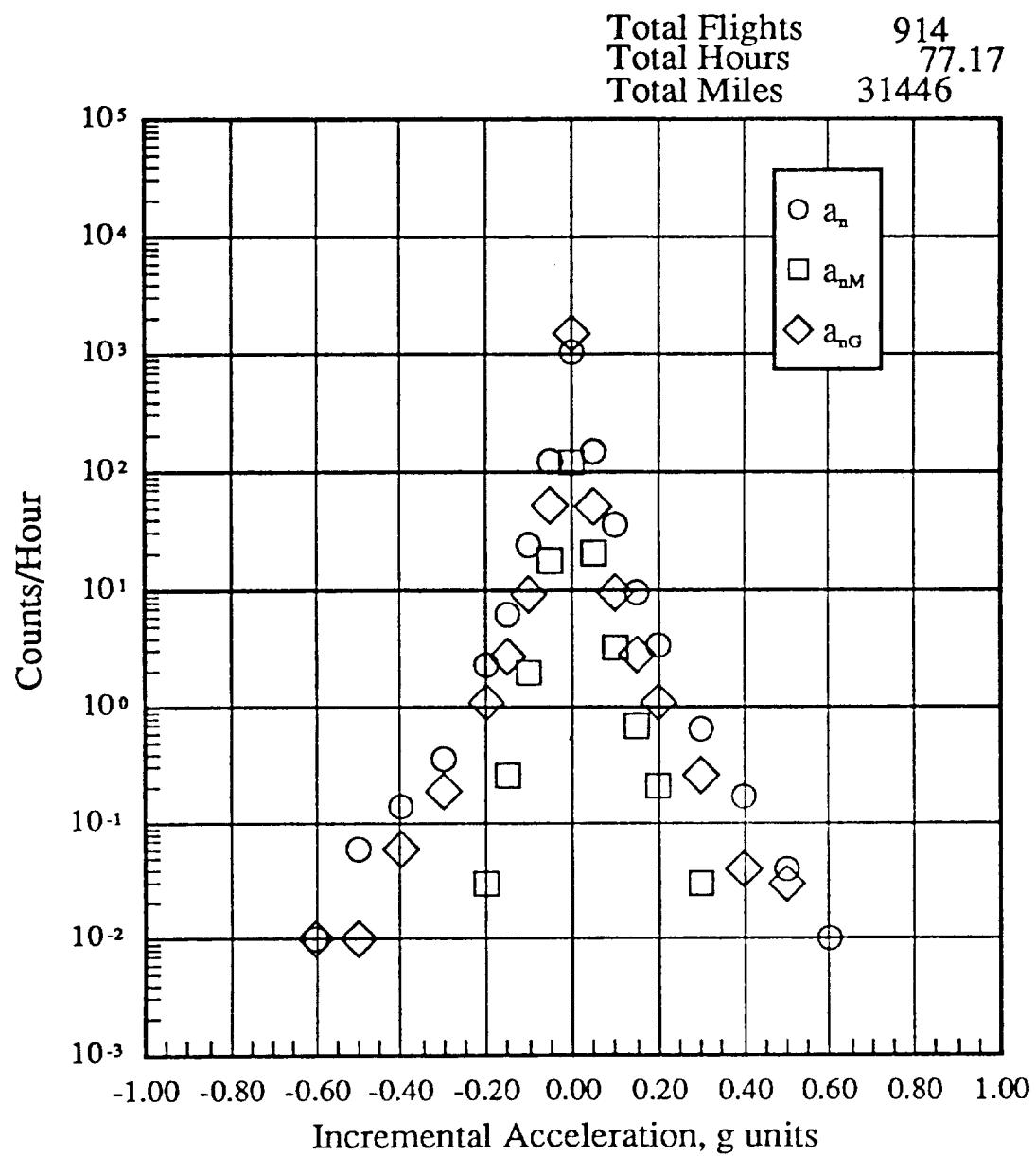
(e)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 4500 to 9500 feet altitude

Figure 13.- Continued.



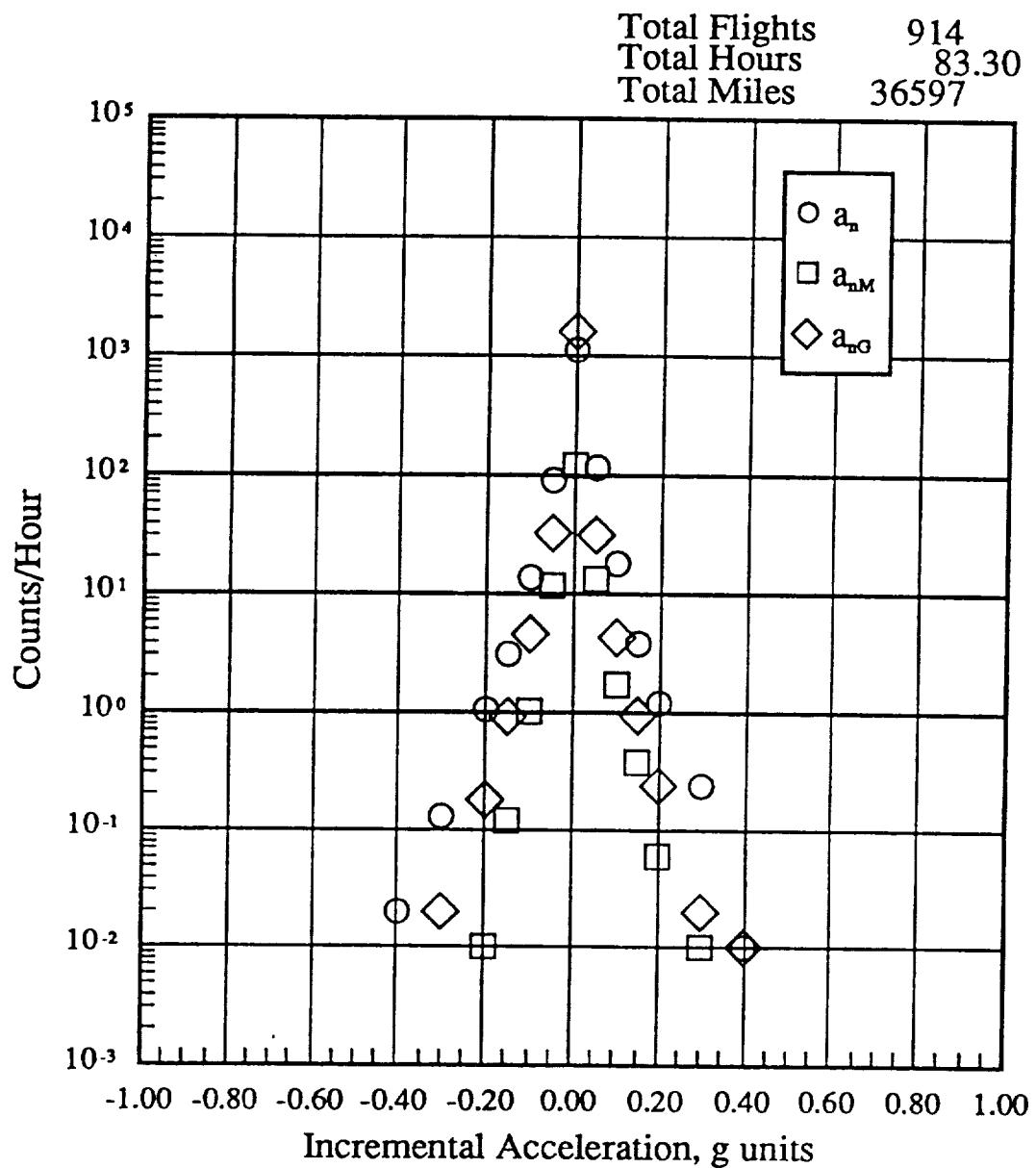
(f)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 9500 to 14500 feet altitude

Figure 13.- Continued.



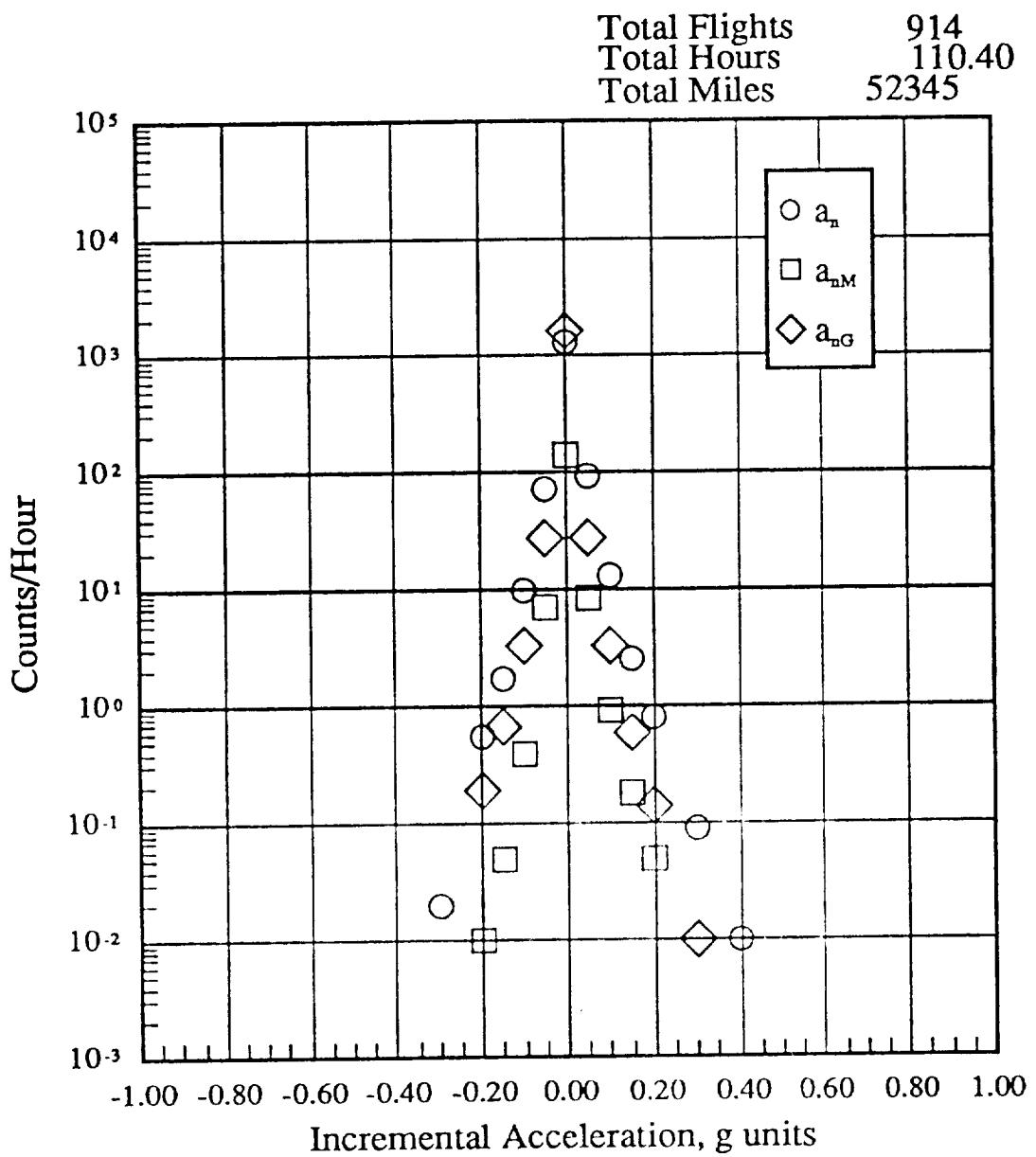
(g)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 14500 to 19500 feet altitude

Figure 13.- Continued.



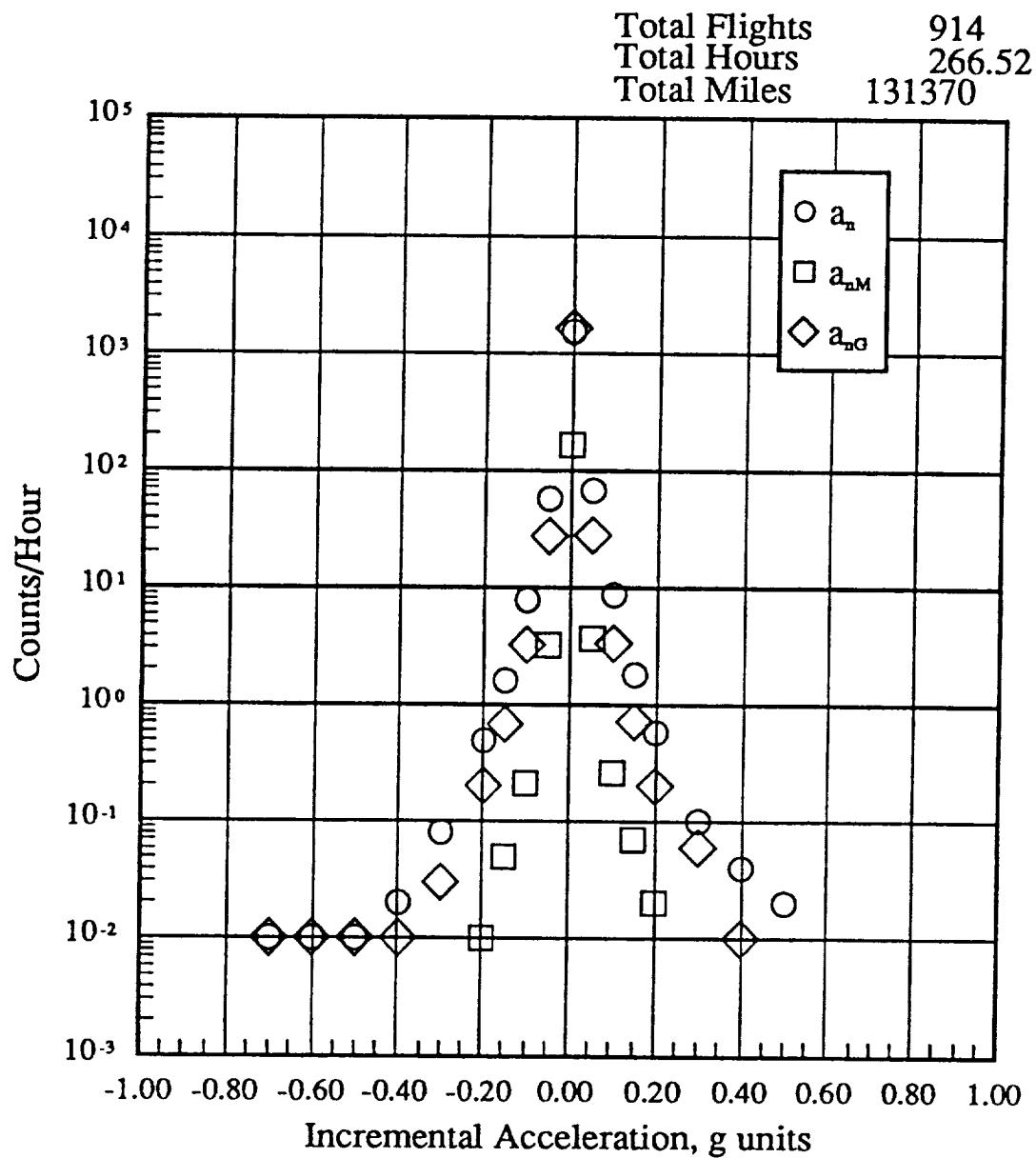
(h)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 19500 to 24500 feet altitude

Figure 13.- Continued.



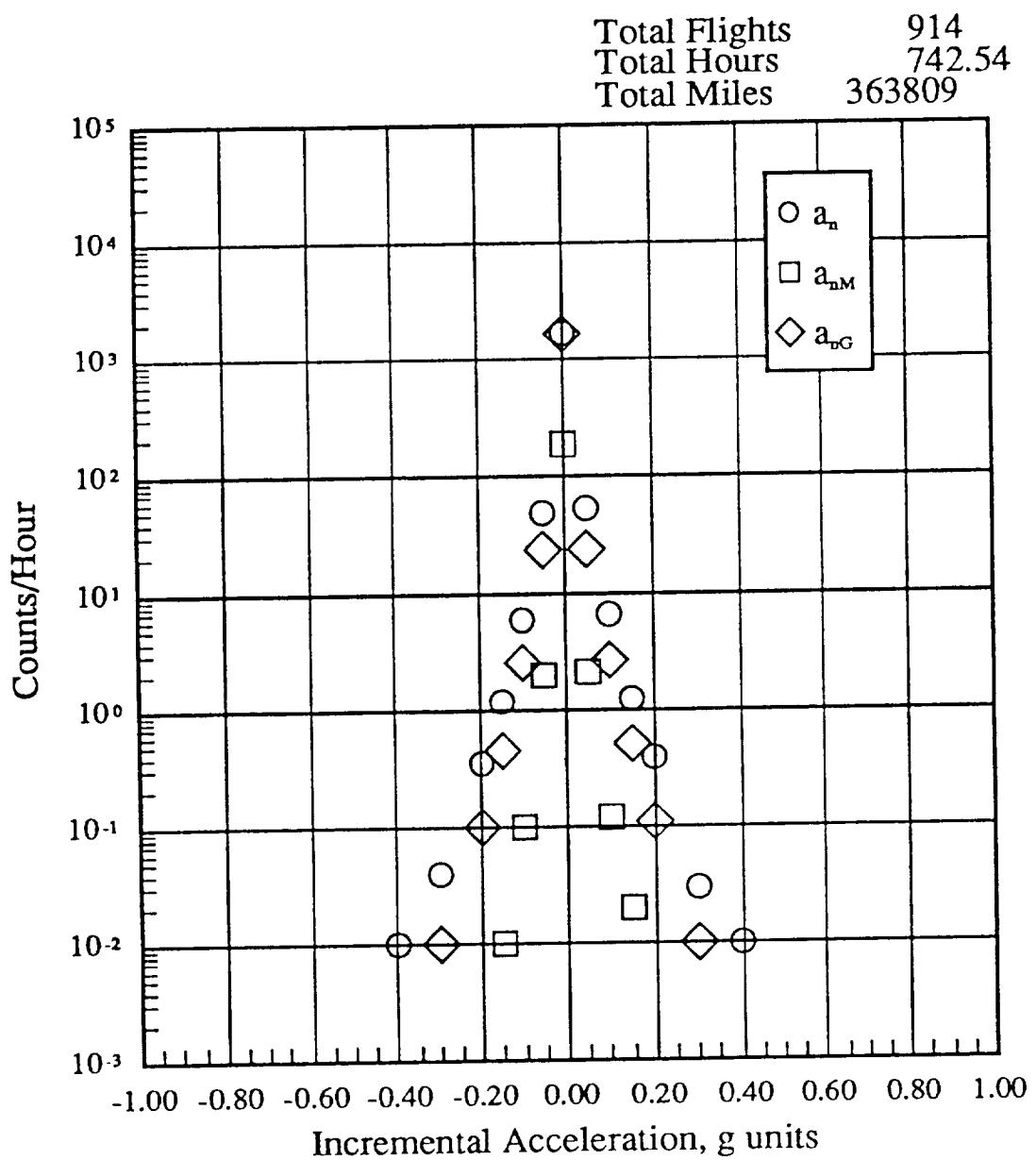
(i)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 24500 to 29500 feet altitude

Figure 13.- Continued.



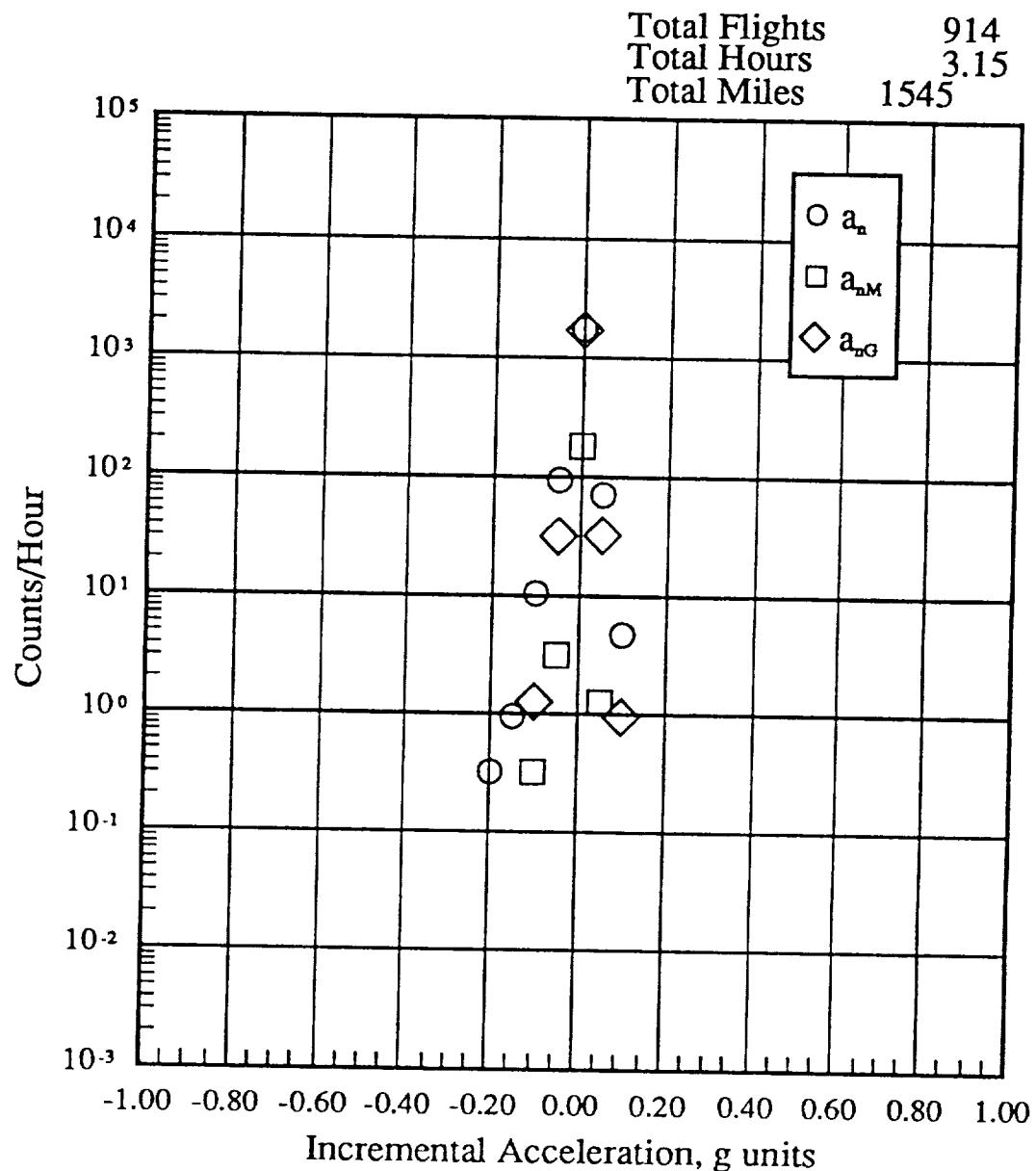
(j)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 29500 to 34500 feet altitude

Figure 13.- Continued.



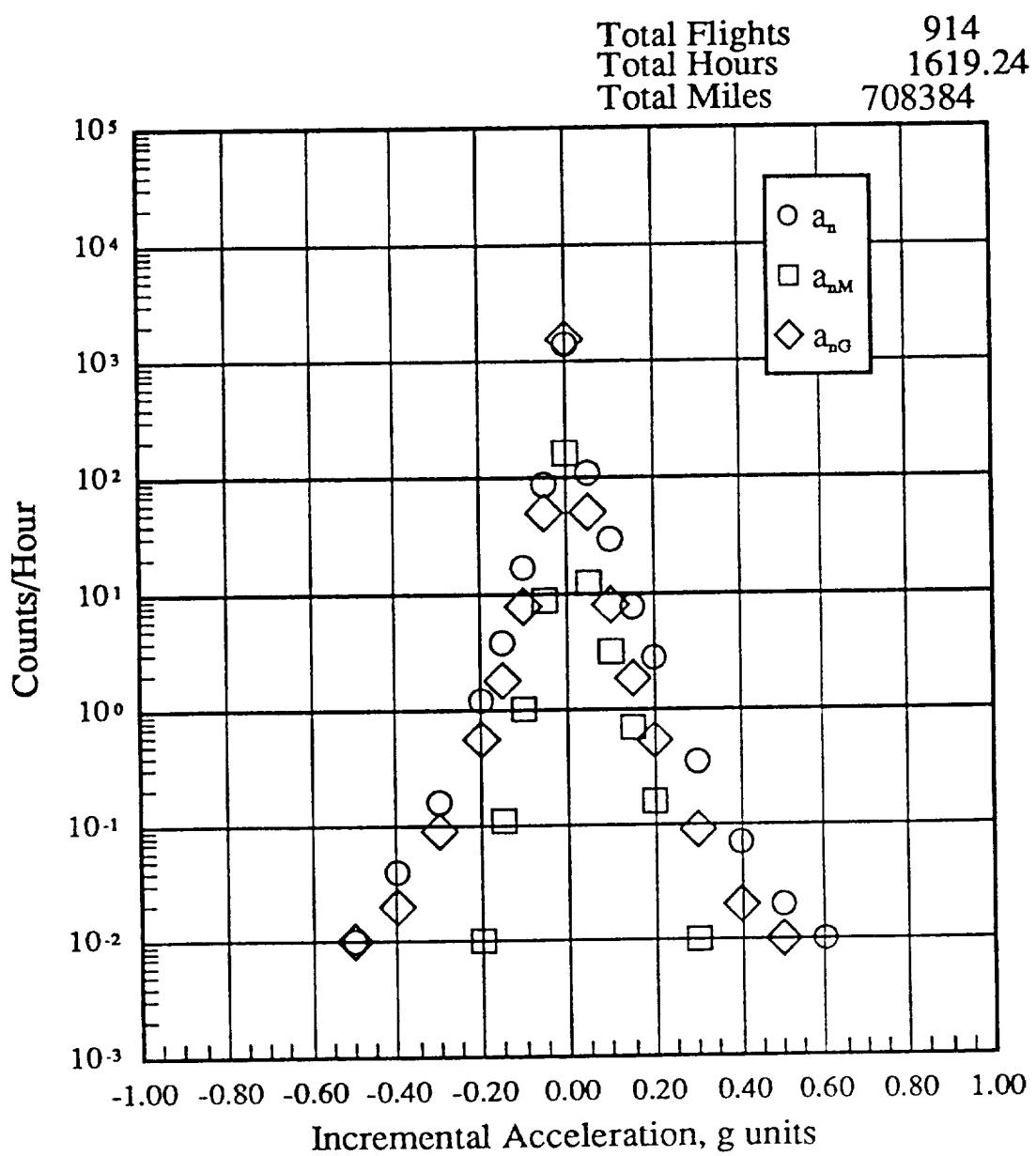
(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

Figure 13.- Continued.



(l)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 39500 to 44500 feet altitude

Figure 13.- Continued.



(m)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 44500 feet altitude

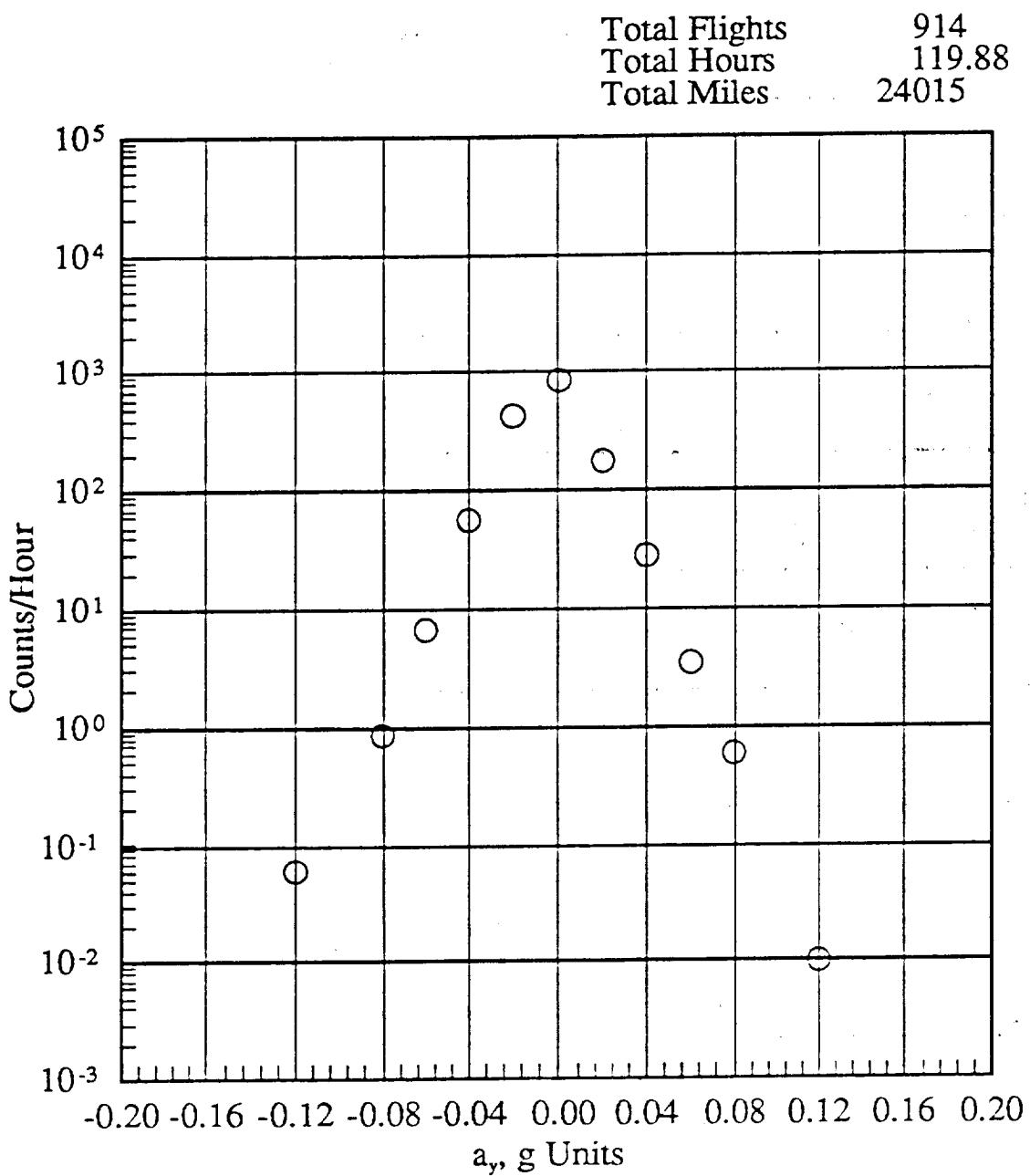
Figure 13.- Concluded.

PRESSURE ALTITUDE BANDS

$a_y$ g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
.48	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0
.16	0	0.02	0	0	0	0	0	0	0	0
.12	0.01	0.04	0.01	0.01	0.02	0	0	0	0	0
.08	0.59	0.43	0.43	0.27	0.08	0.11	0.08	0.04	0.04	0.01
.06	3.47	1.89	1.78	0.83	0.44	0.37	0.27	0.22	0.32	0.16
.04	28.28	12.22	10.33	6.10	3.27	2.79	2.01	1.70	0.32	0.74
.02	178.39	84.20	74.01	58.79	40.25	29.99	20.82	18.29	3.49	5.36
0	859.73	718.92	727.68	768.95	787.00	969.87	1323.92	1497.85	45.07	42.56
-.02	430.65	172.22	120.92	81.14	47.85	33.95	25.77	19.75	1679.24	1211.54
-.04	56.94	19.50	11.39	6.97	2.59	2.12	1.86	1.39	32.69	73.36
-.06	6.73	2.76	1.94	1.21	0.40	0.26	0.22	0.21	2.22	7.82
-.08	0.86	0.63	0.50	0.29	0.16	0.05	0.04	0.04	0	1.04
-.12	0.06	0.12	0.06	0.04	0	0	0	0	0	0.19
-.16	0	0	0.04	0	0.01	0	0	0	0	0.02
-.20	0	0	0.01	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	133369.92	363808.53	1545.14	70833.60
TOTAL FLIGHTS									914	
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									1619.24	
TOTAL FLIGHT MILES FLAPS UP AND DOWN									70833.60	

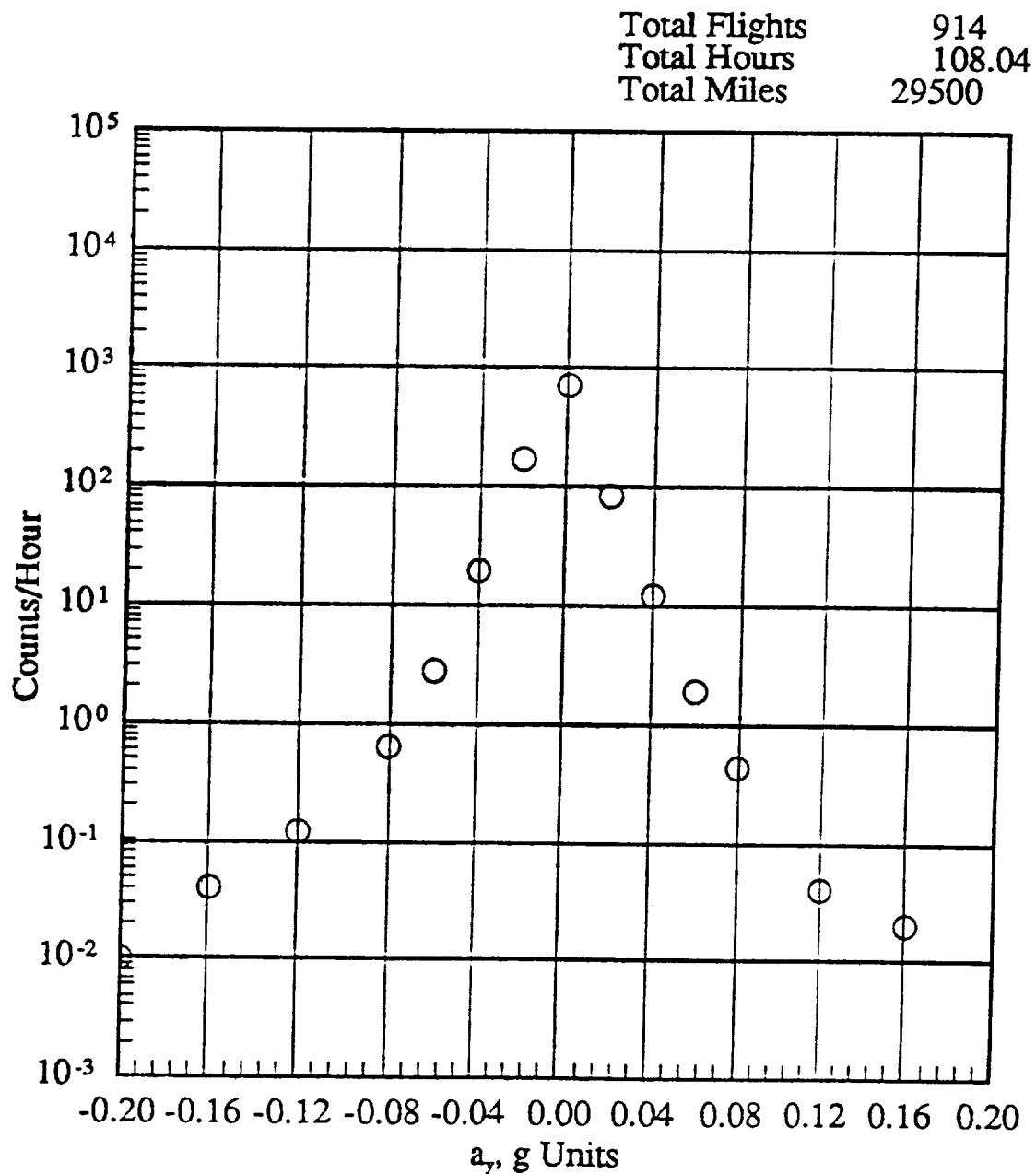
(a)  $a_y$  Level crossing counts per hour with in pressure altitude bands

Figure 14.- Lateral acceleration exceedances.



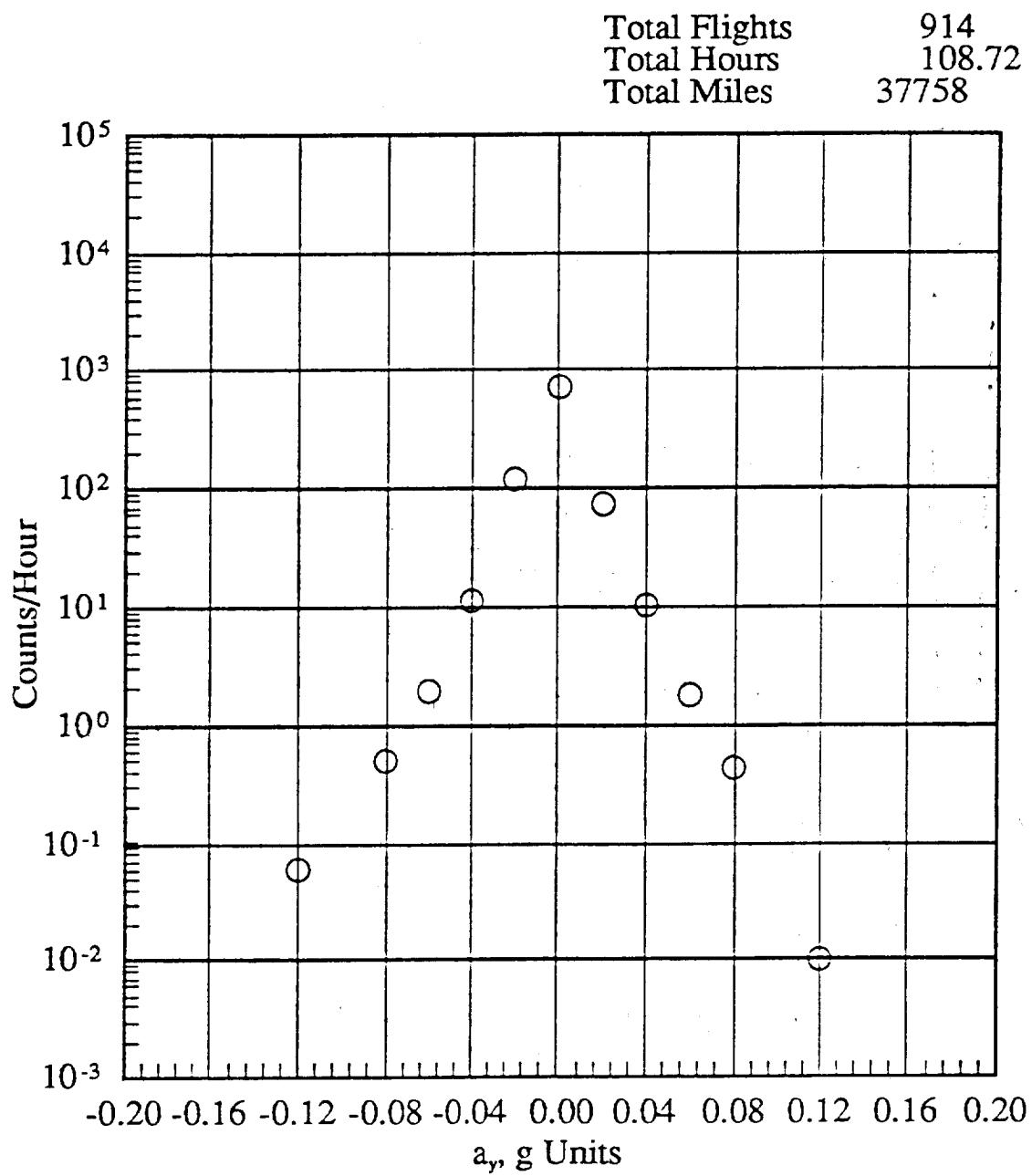
(b) -500 to 4500 feet altitude

Figure 14.- Continued.



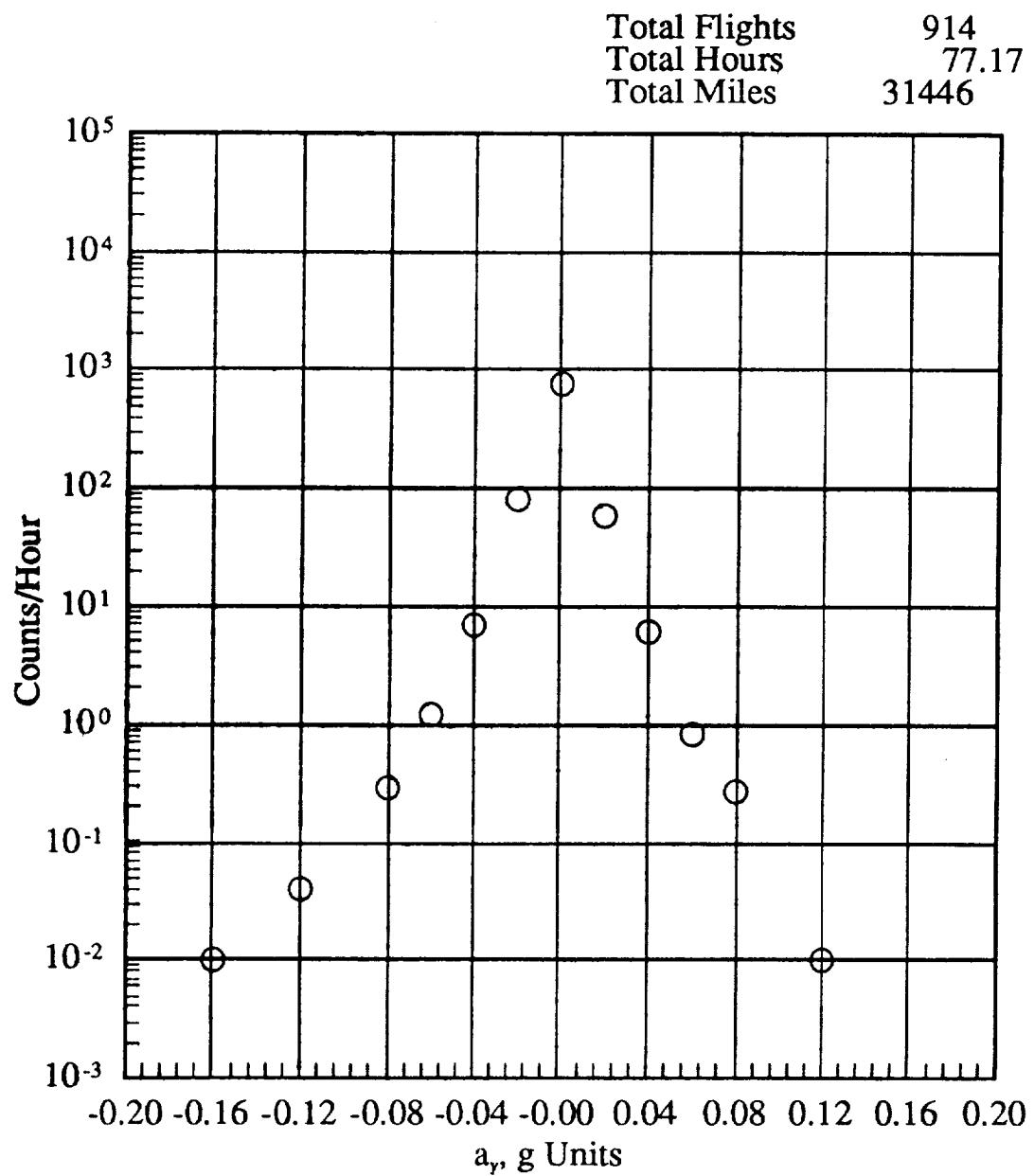
(c) 4500 to 9500 feet altitude

Figure 14.- Continued.



(d) 9500 to 14500 feet altitude

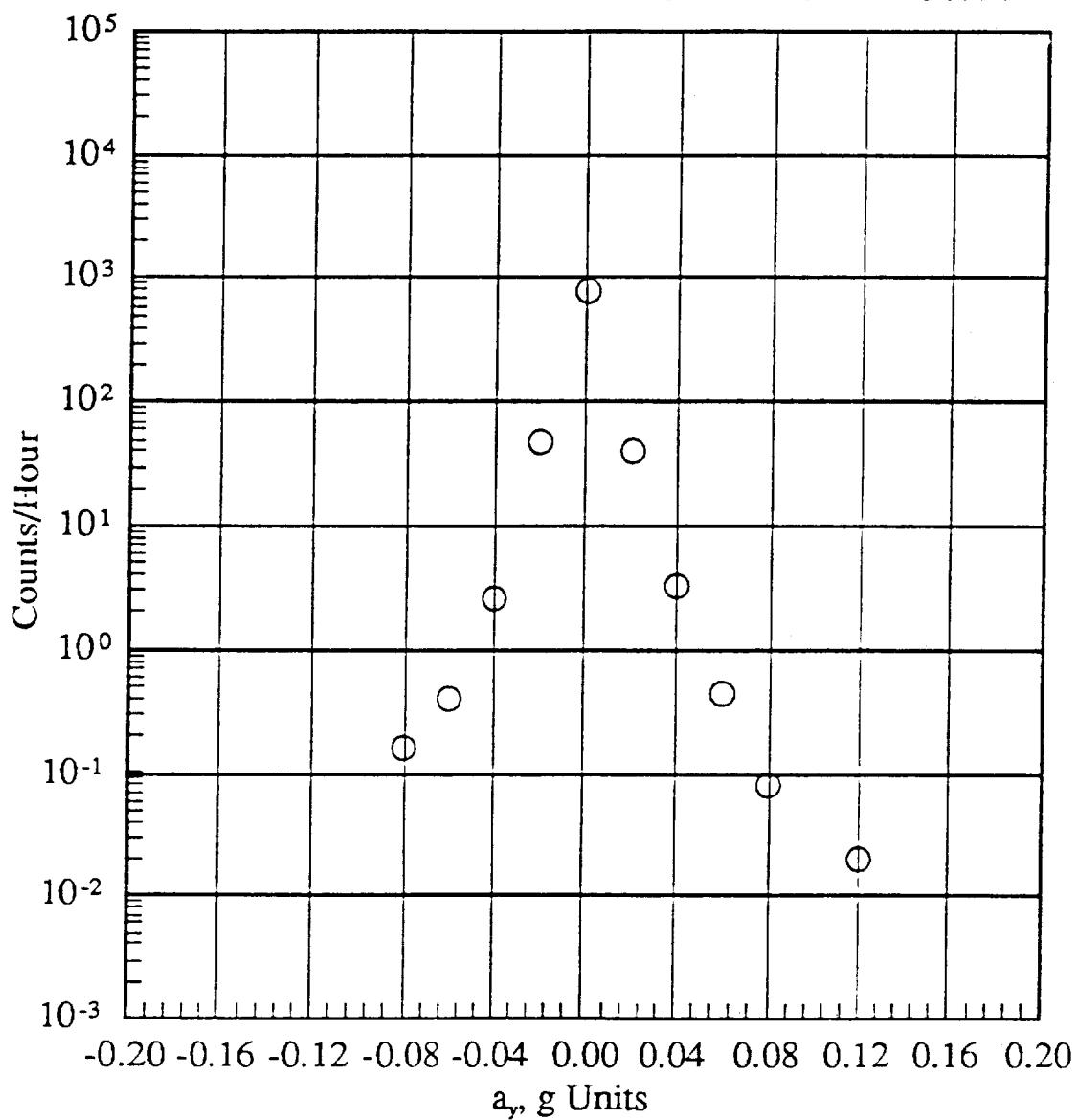
Figure 14.- Continued.



(e) 14500 to 19500 feet altitude

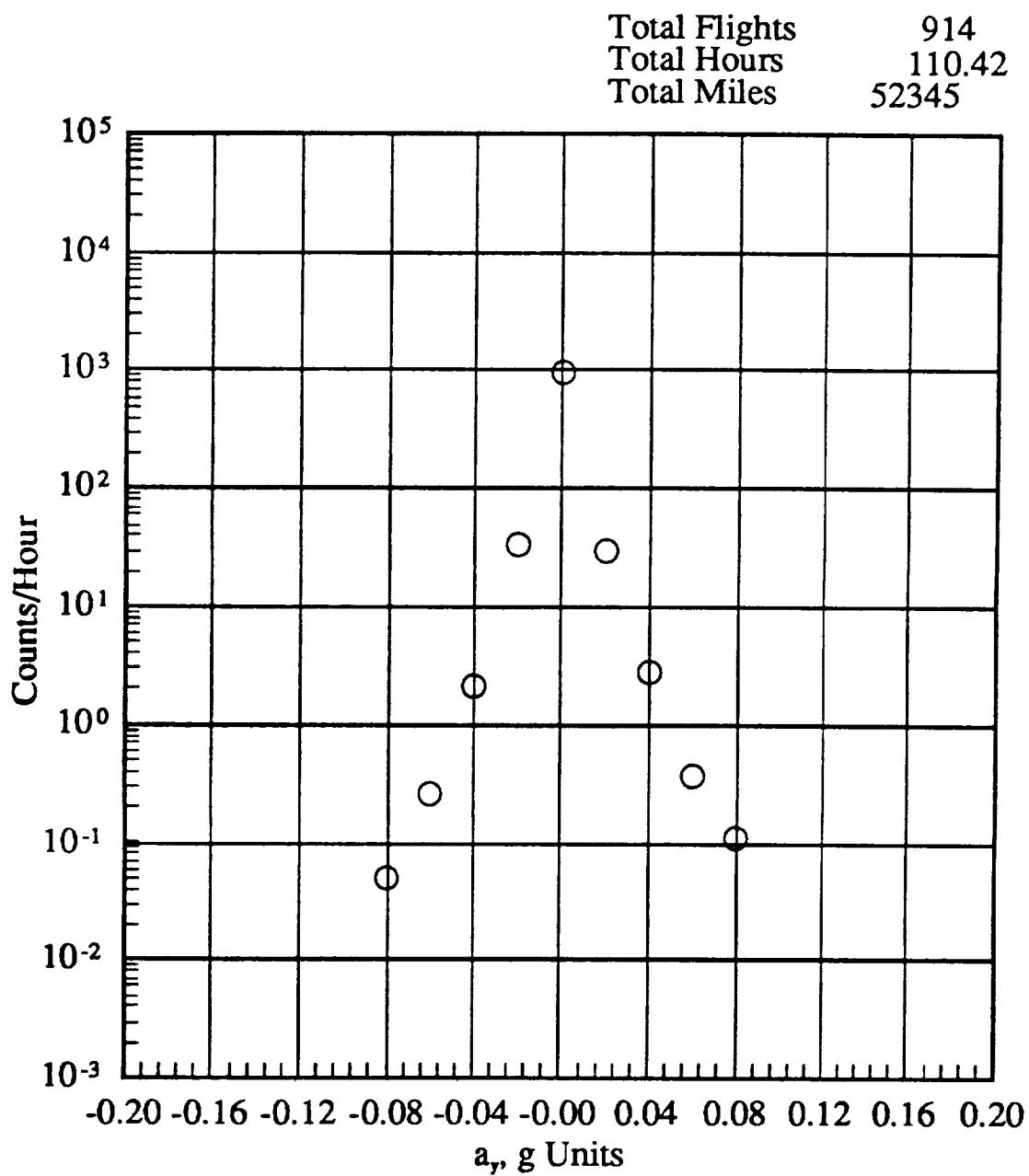
Figure 14.- Continued.

Total Flights	914
Total Hours	83.30
Total Miles	36597



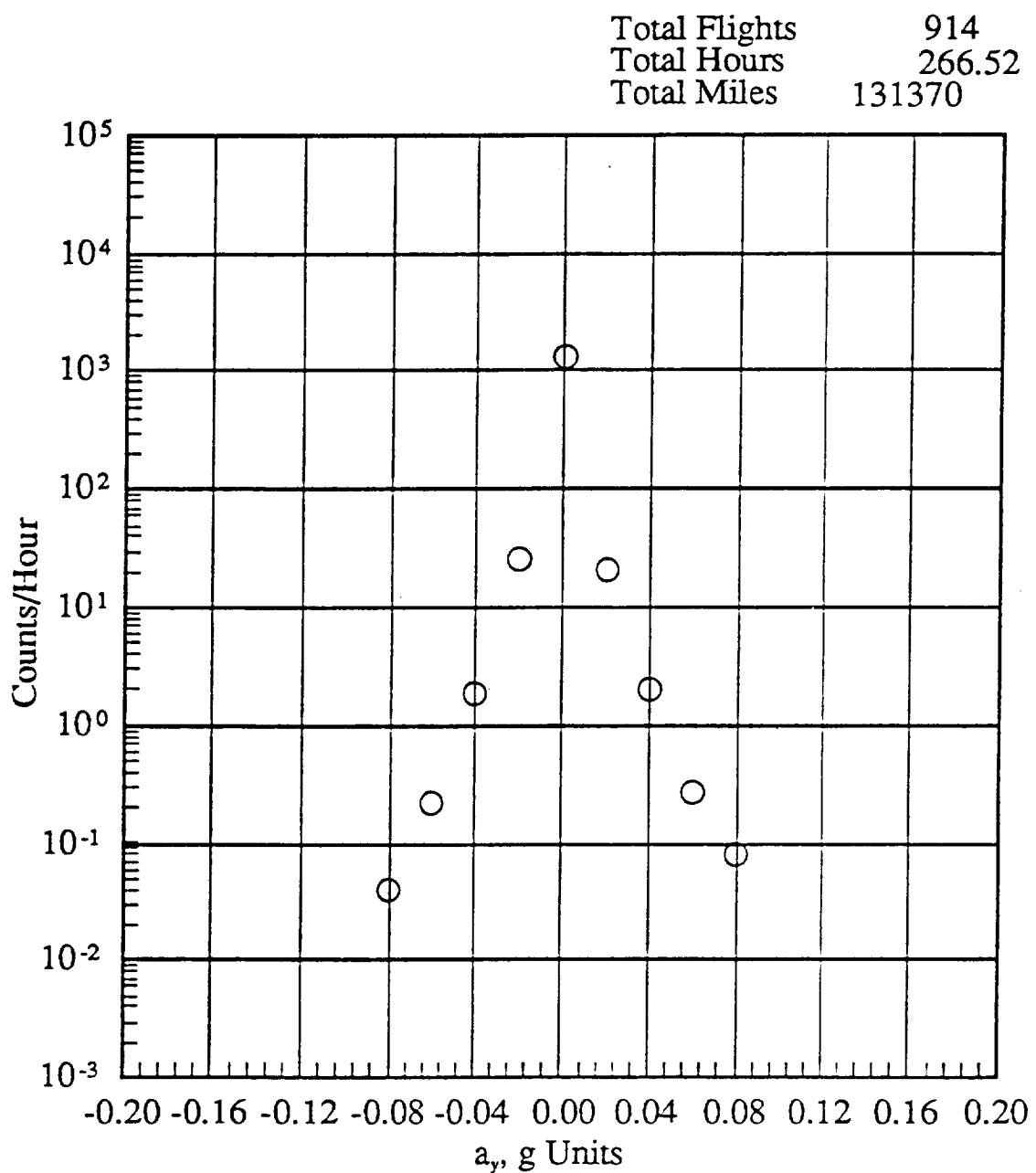
(f) 19500 to 24500 feet altitude

Figure 14.- Continued.



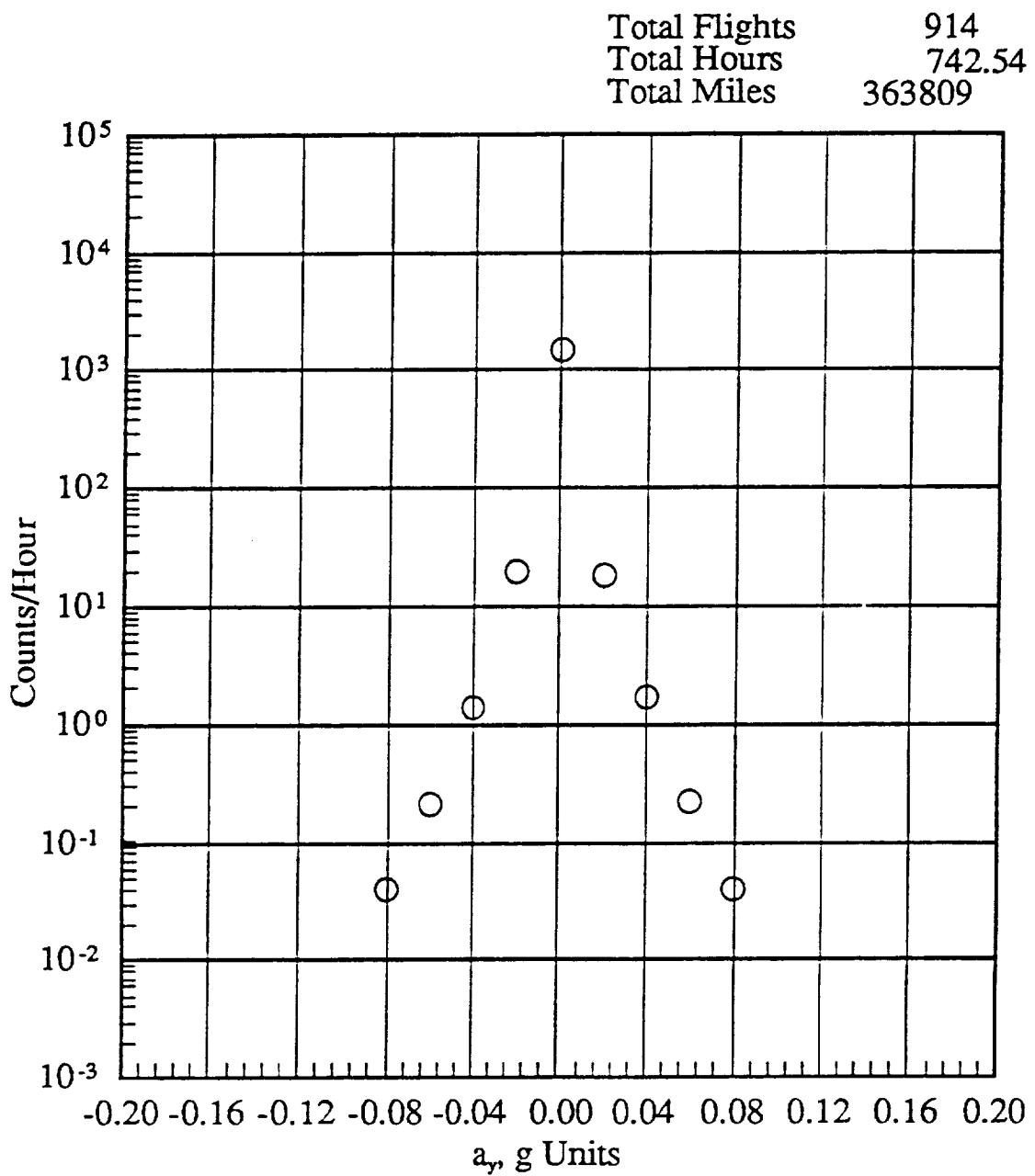
(g) 24500 to 29500 feet altitude

Figure 14.- Continued.



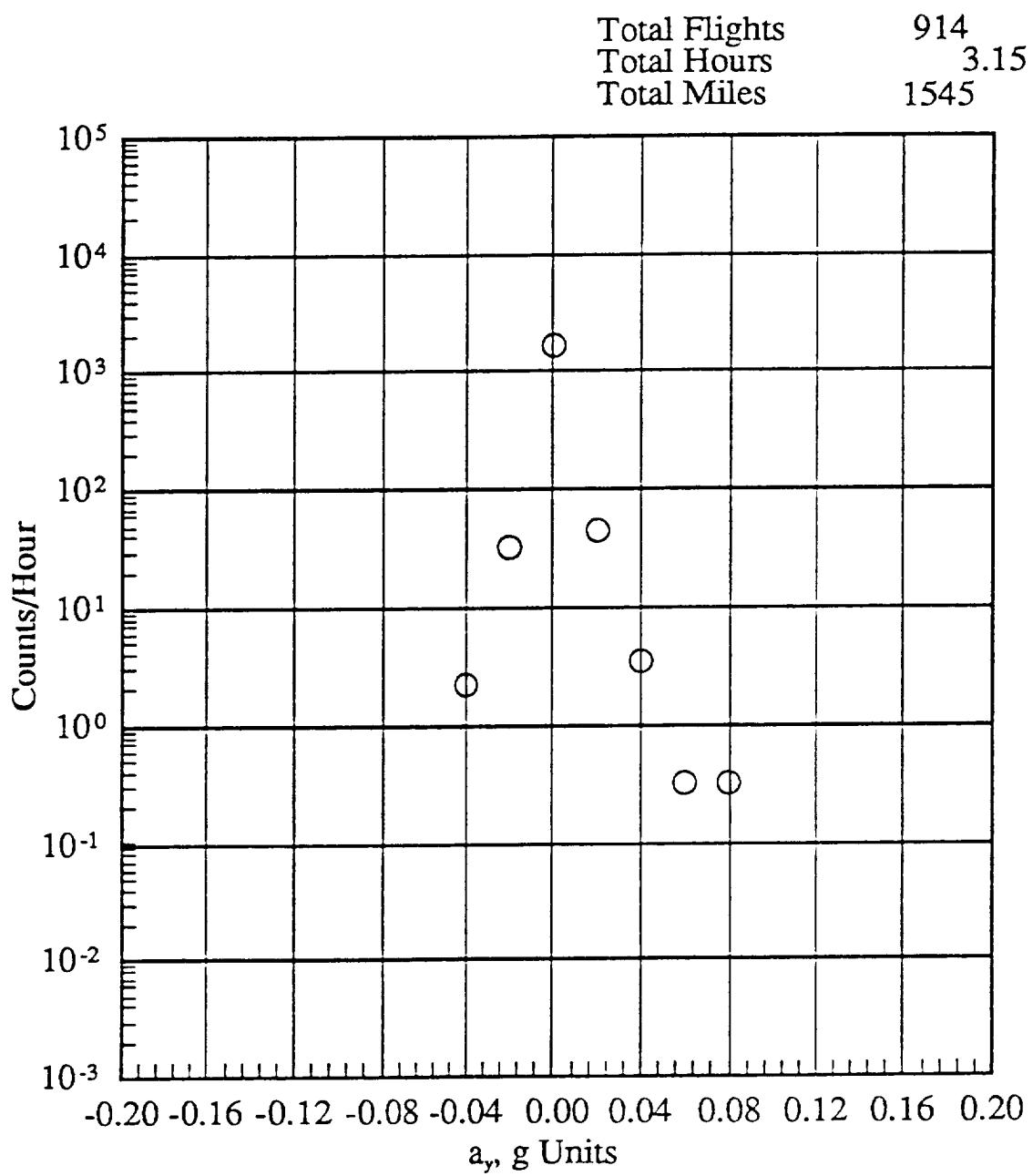
(h) 29500 to 34500 feet altitude

Figure 14.- Continued.



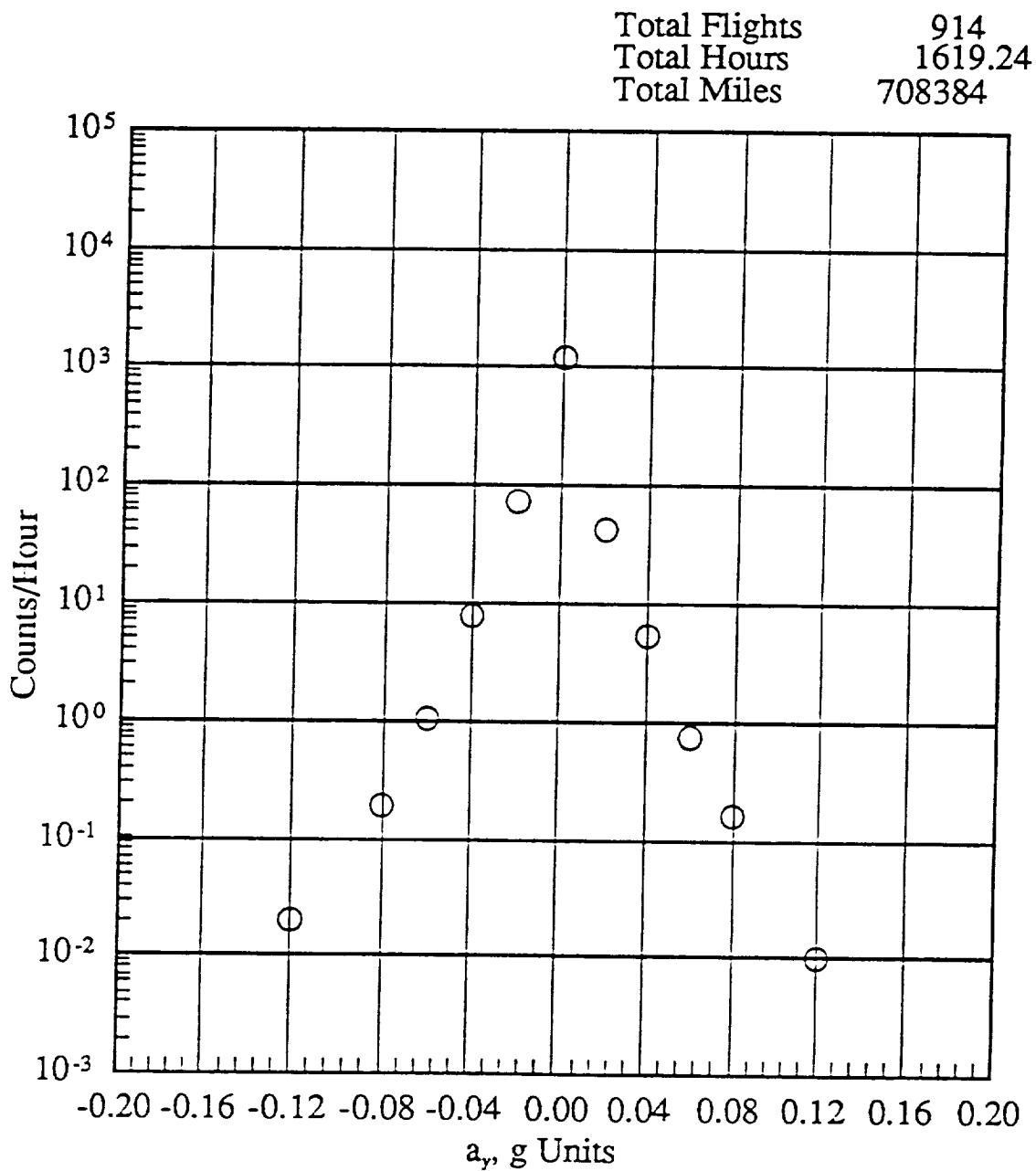
(i) 34500 to 39500 feet altitude

Figure 14.- Continued.



(j) 39500 to 44500 feet altitude

Figure 14.- Continued.



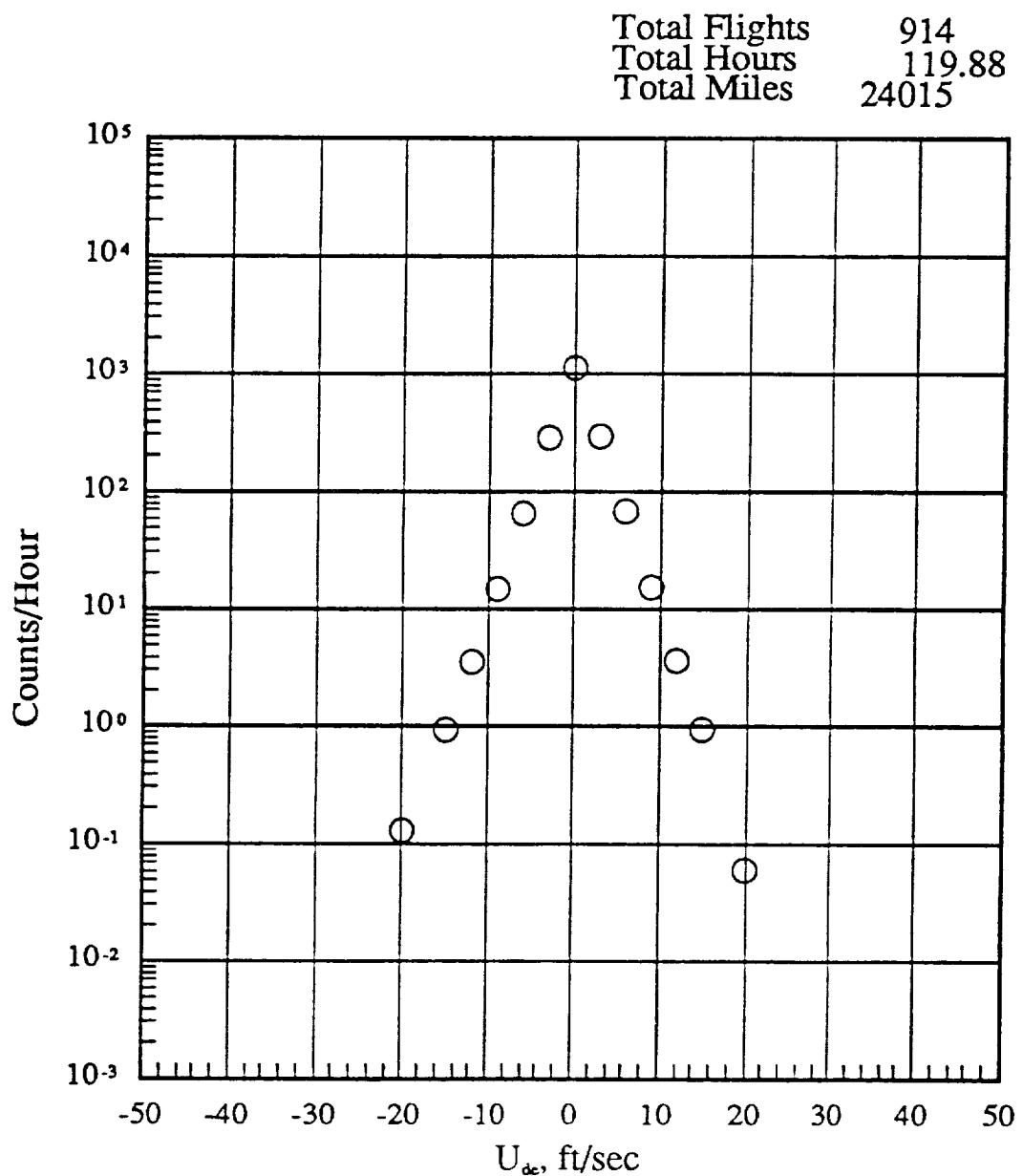
(k) -500 to 44500 feet altitude

Figure 14.- Concluded.

		PRESSURE ALTITUDE BANDS									
		4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO -4500 FT	
DERIVED GUST	VELOCITY LEVEL	-500 TO 4500 FT	-500 TO 4500 FT	-500 TO 4500 FT	-500 TO 4500 FT	-500 TO 4500 FT	-500 TO 4500 FT	-500 TO 4500 FT	-500 TO 4500 FT	-500 TO 4500 FT	
100	0	0	0	0	0	0	0	0	0	0	
90	0	0	0	0	0	0	0	0	0	0	
80	0	0	0	0	0	0	0	0	0	0	
70	0	0	0	0	0	0	0	0	0	0	
60	0	0	0	0	0	0	0	0	0	0	
50	0	0	0	0	0	0	0	0	0	0	
40	0	0	0.01	0	0	0	0	0	0	0	
30	0	0.01	0.02	0	0	0	0	0	0	0	
20	0.06	0.10	0.06	0.03	0	0	0	0	0	0.02	
15	0.94	0.41	0.29	0.13	0.01	0	0	0	0	0.12	
12	3.64	1.12	0.56	0.26	0.04	0.01	0.03	0	0	0.40	
9	15.31	3.41	1.64	0.71	0.11	0.04	0.09	0.02	0	1.53	
6	67.82	13.76	7.06	2.73	0.71	0.38	0.40	0.21	0	6.75	
3	294.80	71.46	38.04	18.43	8.18	5.41	4.93	4.30	1.59	33.51	
0	1121.52	1205.66	1383.02	1505.45	1602.97	1623.82	1647.05	1651.64	1702.41	1552.74	
-3	286.81	72.53	38.67	19.37	8.34	5.30	4.78	4.14	1.90	32.98	
-6	64.94	13.24	6.55	2.67	0.77	0.37	0.36	0.20	0	6.45	
-9	14.83	3.46	1.89	0.67	0.14	0.06	0.06	0.03	0	1.52	
-12	3.55	1.21	0.57	0.17	0.04	0	0.02	0.01	0	0.40	
-15	0.93	0.51	0.24	0.08	0	0	0.01	0	0	0.12	
-20	0.13	0.11	0.06	0.01	0	0	0.01	0	0	0.02	
-30	0	0	0	0	0	0	0	0	0	0	
-40	0	0	0	0	0	0	0	0	0	0	
-50	0	0	0	0	0	0	0	0	0	0	
-60	0	0	0	0	0	0	0	0	0	0	
-70	0	0	0	0	0	0	0	0	0	0	
-80	0	0	0	0	0	0	0	0	0	0	
-90	0	0	0	0	0	0	0	0	0	0	
-100	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS & ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24	
FLIGHT MILES & ALT	24014.89	29500.10	37757.93	31445.86	36599.70	52344.52	131369.92	363808.53	1545.14	708383.60	
		TOTAL FLIGHTS									
		TOTAL FLIGHT HOURS FLAPS UP AND DOWN									
		TOTAL FLIGHT MILES FLAPS UP AND DOWN									

(a)  $U_{de}$  Level crossing counts per hour within pressure altitude bands.

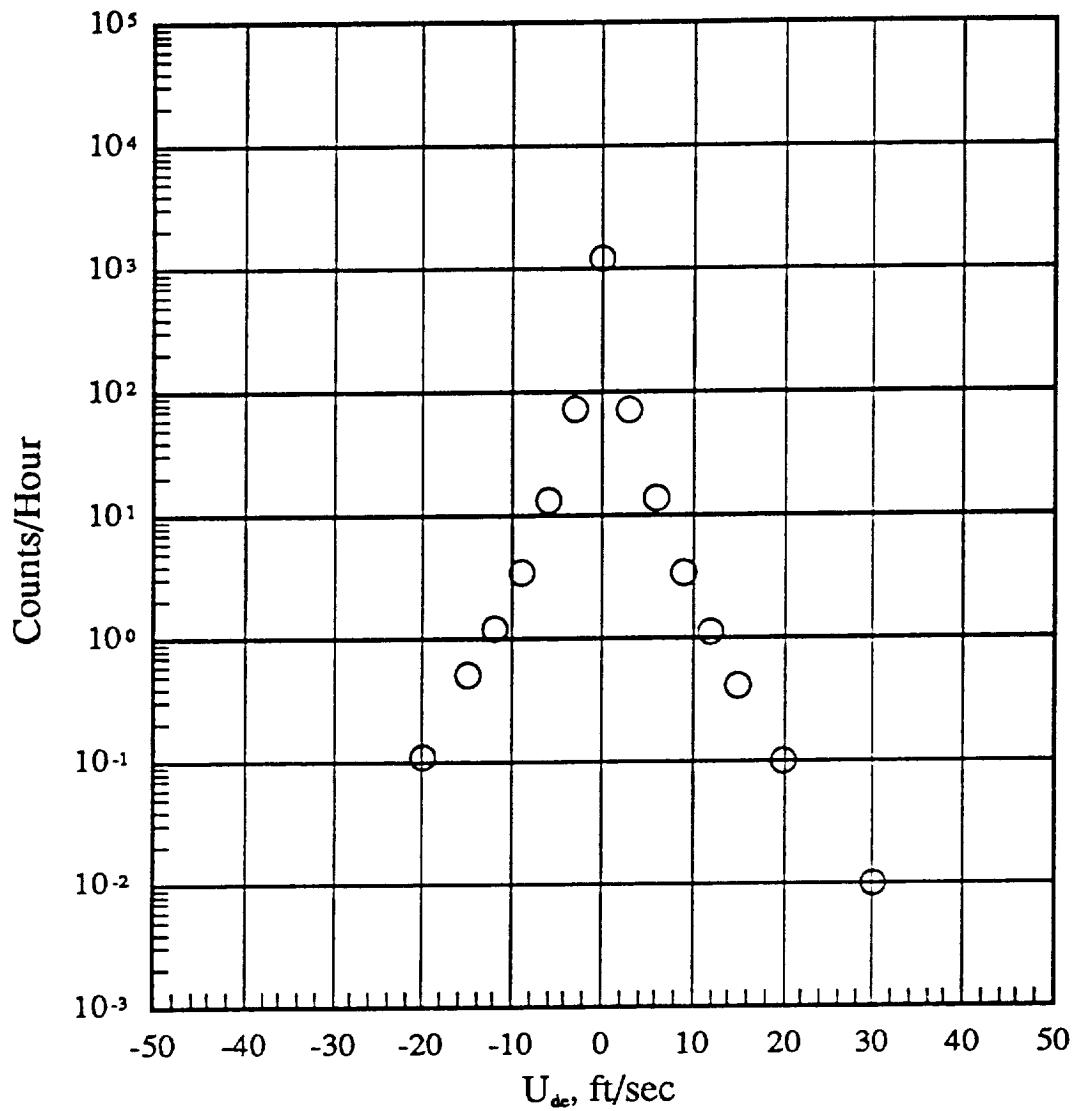
Figure 15.-  $U_{de}$  Exceedances



(b) -500 to 4500 feet altitude

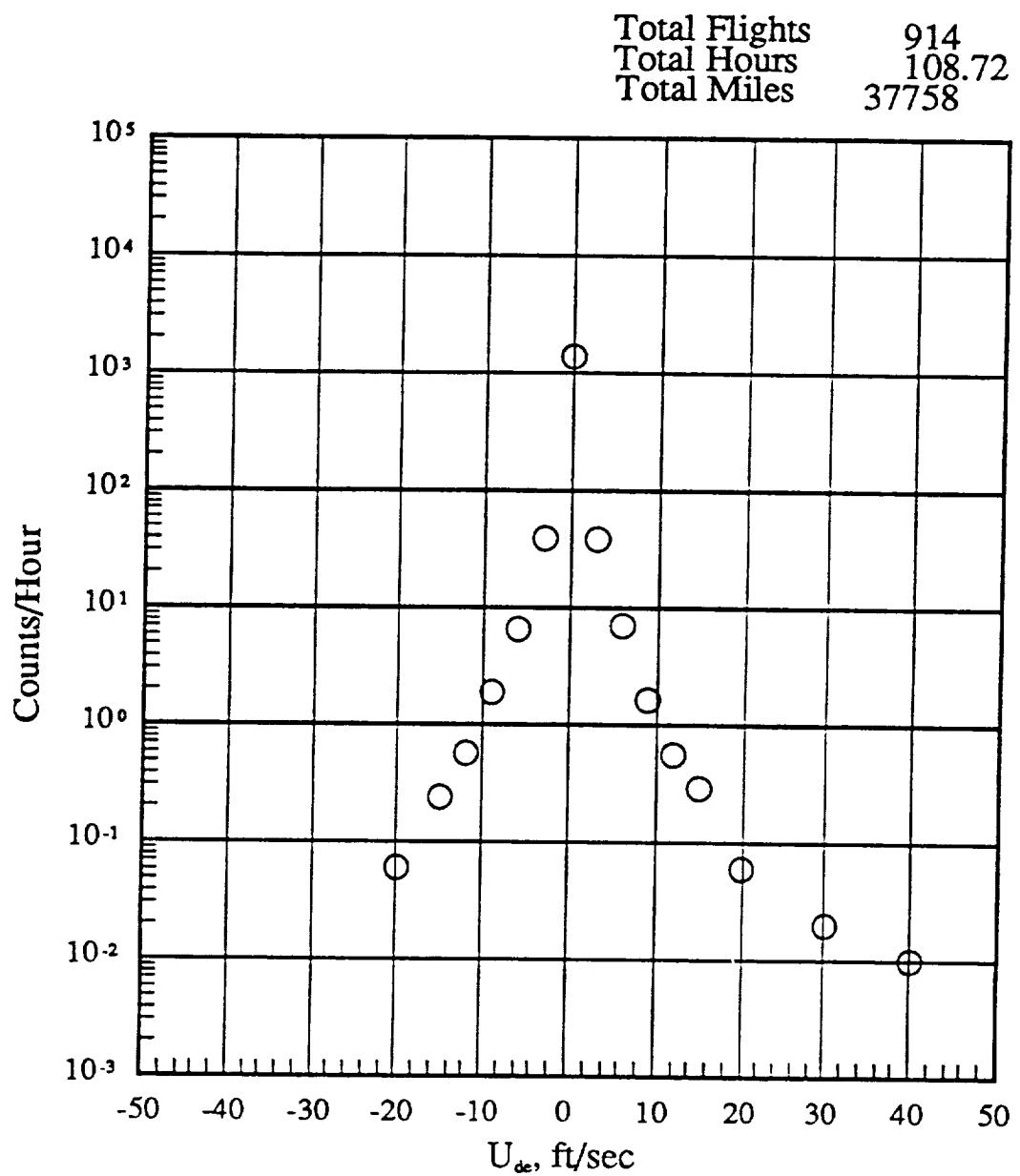
Figure 15.- Continued.

Total Flights 914  
 Total Hours 108.04  
 Total Miles 29500



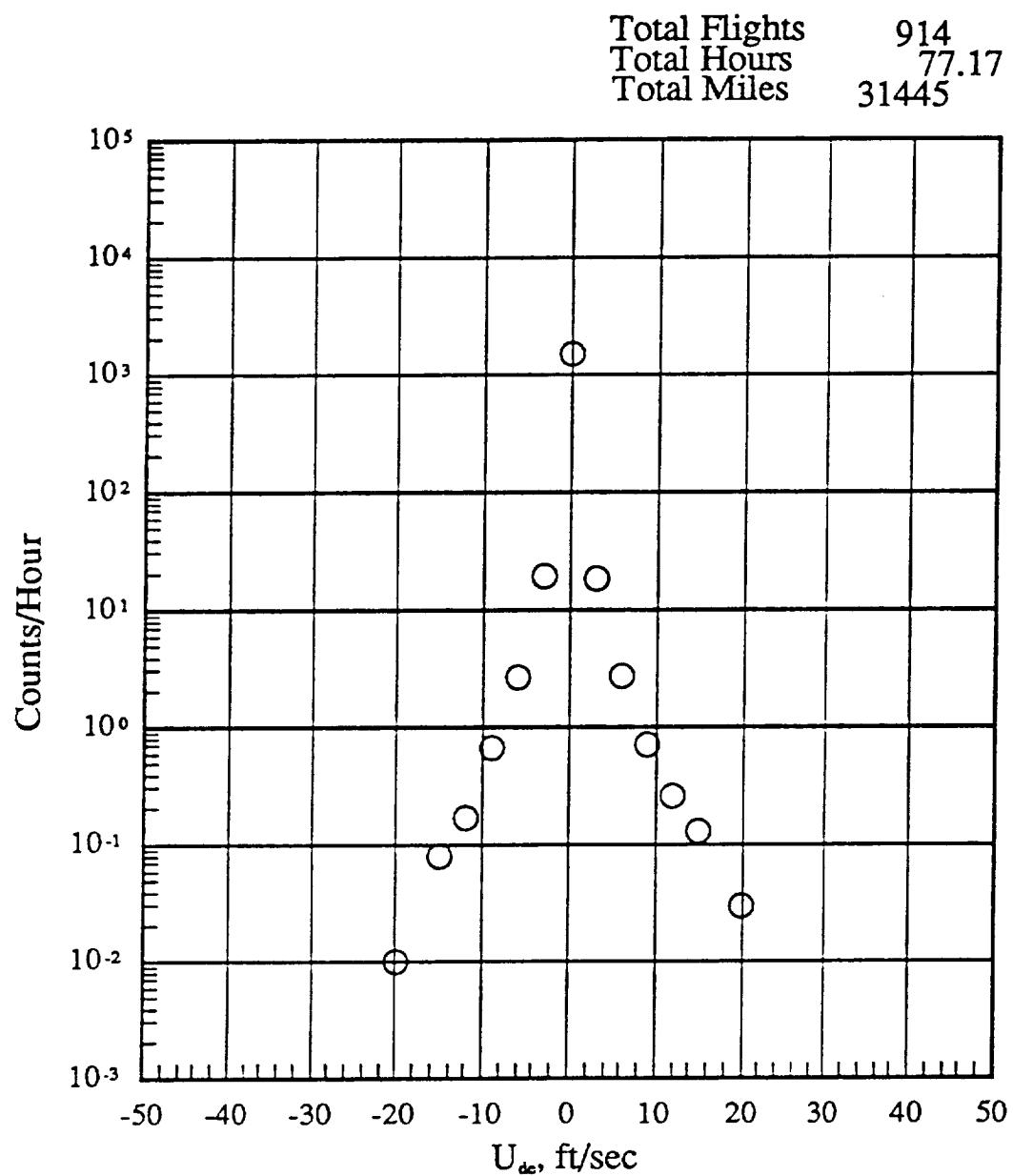
(c) 4500 to 9500 feet altitude

Figure 15.- Continued.



(d) 9500 to 14500 feet altitude

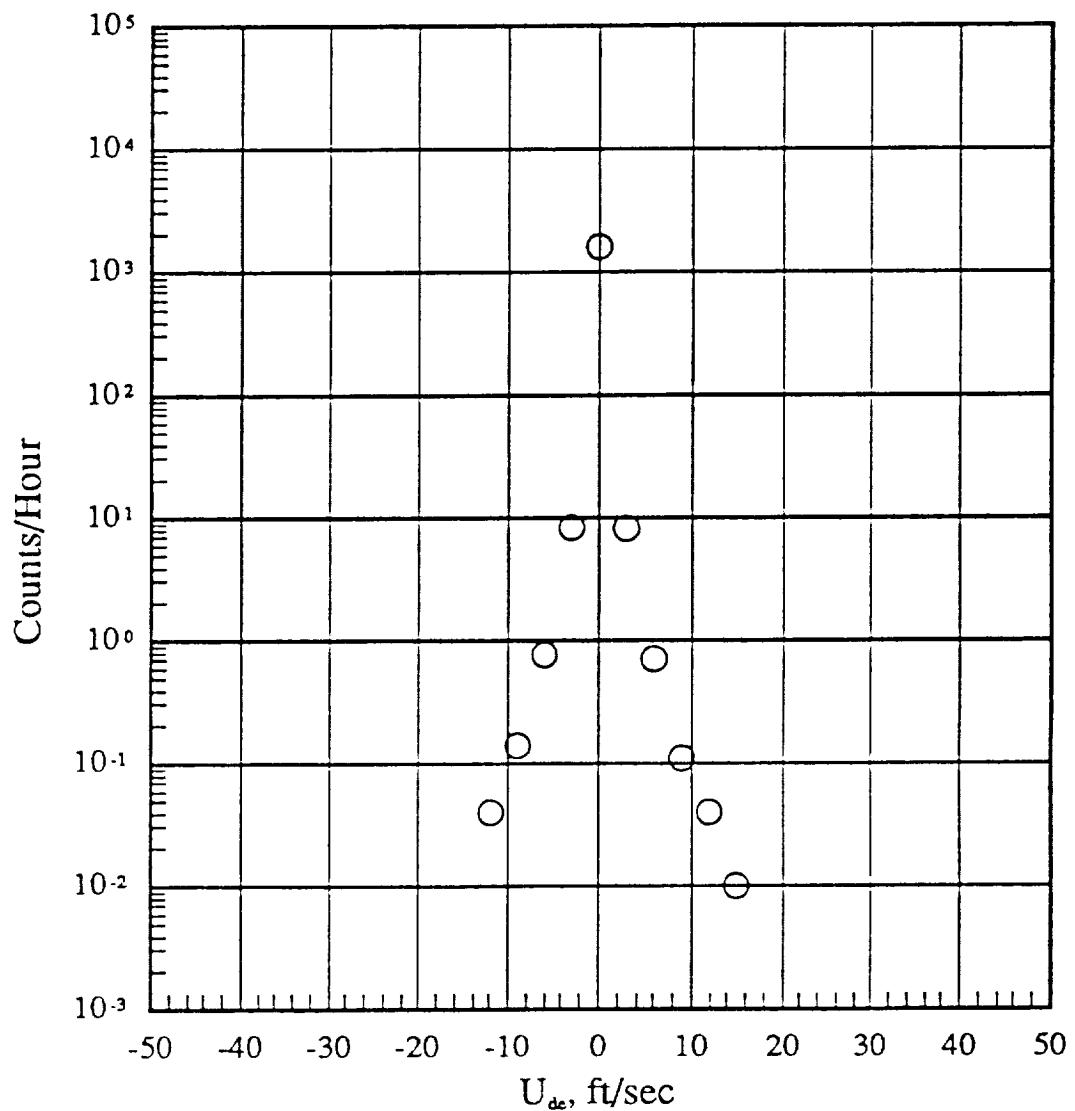
Figure 15.- Continued.



(e) 14500 to 19500 feet altitude

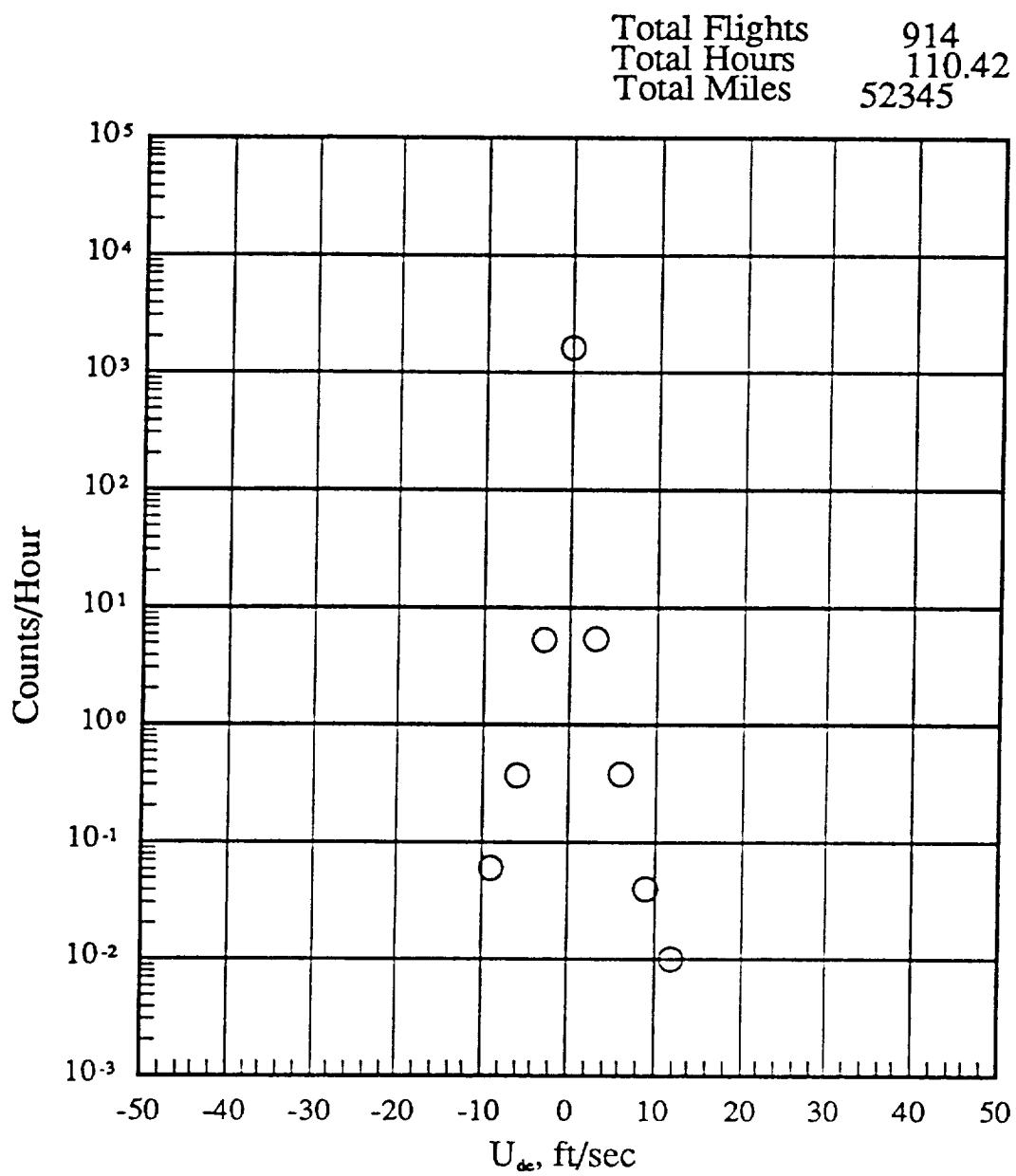
Figure 15.- Continued.

Total Flights      914  
 Total Hours      83.30  
 Total Miles      36597



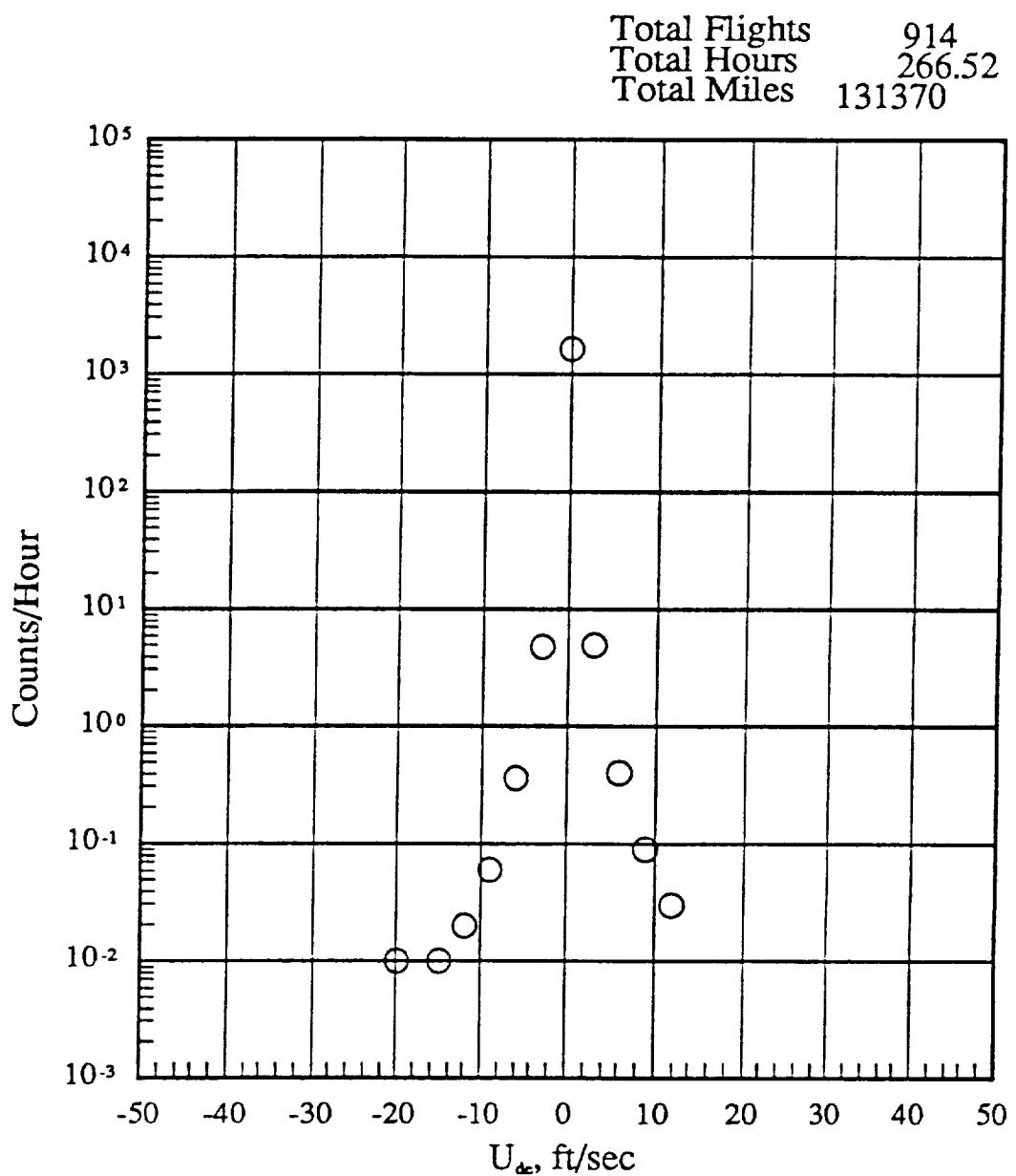
(f) 19500 to 24500 feet altitude

Figure 15.- Continued.



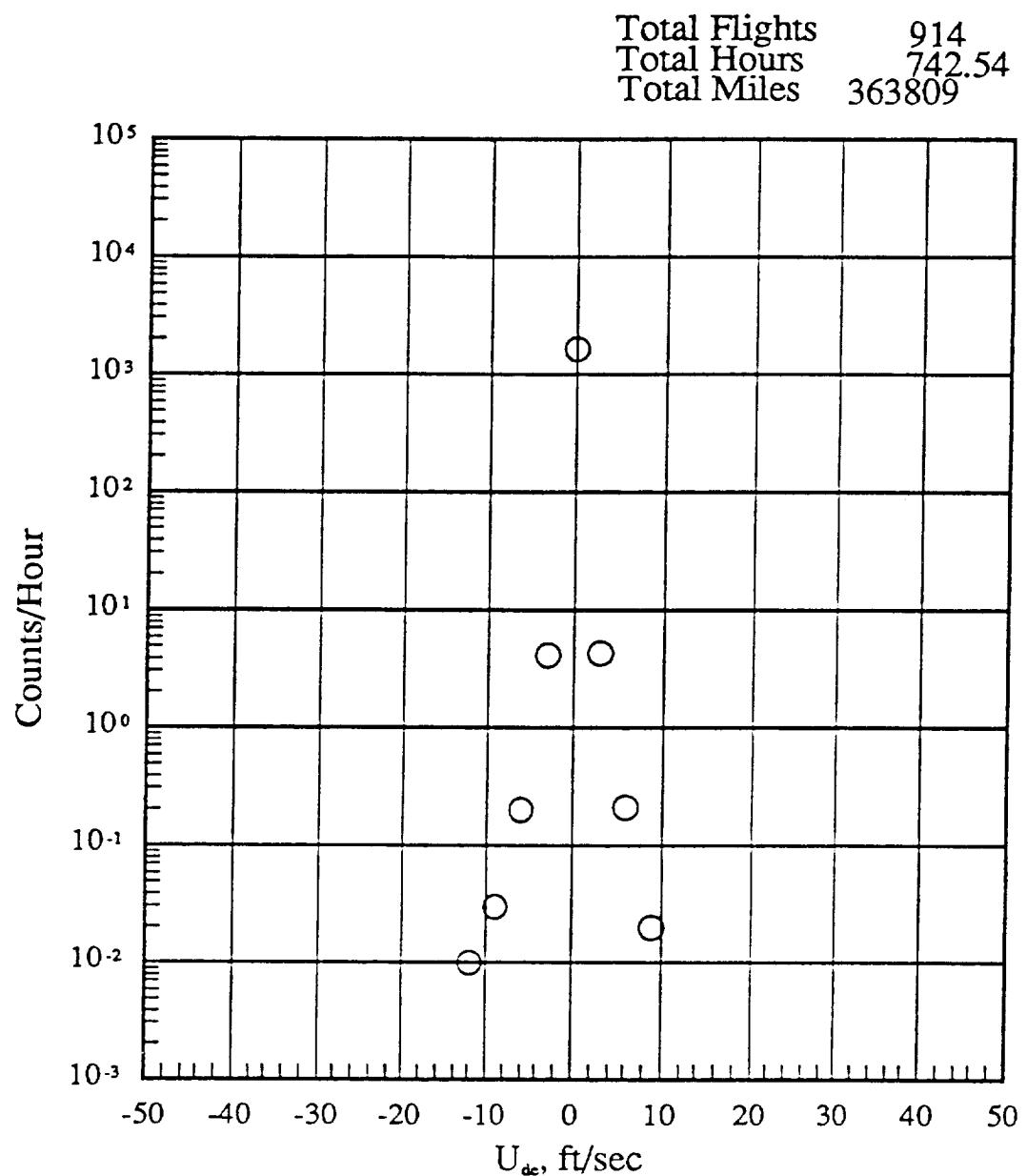
(g) 24500 to 29500 feet altitude

Figure 15.- Continued.



(h) 29500 to 34500 feet altitude

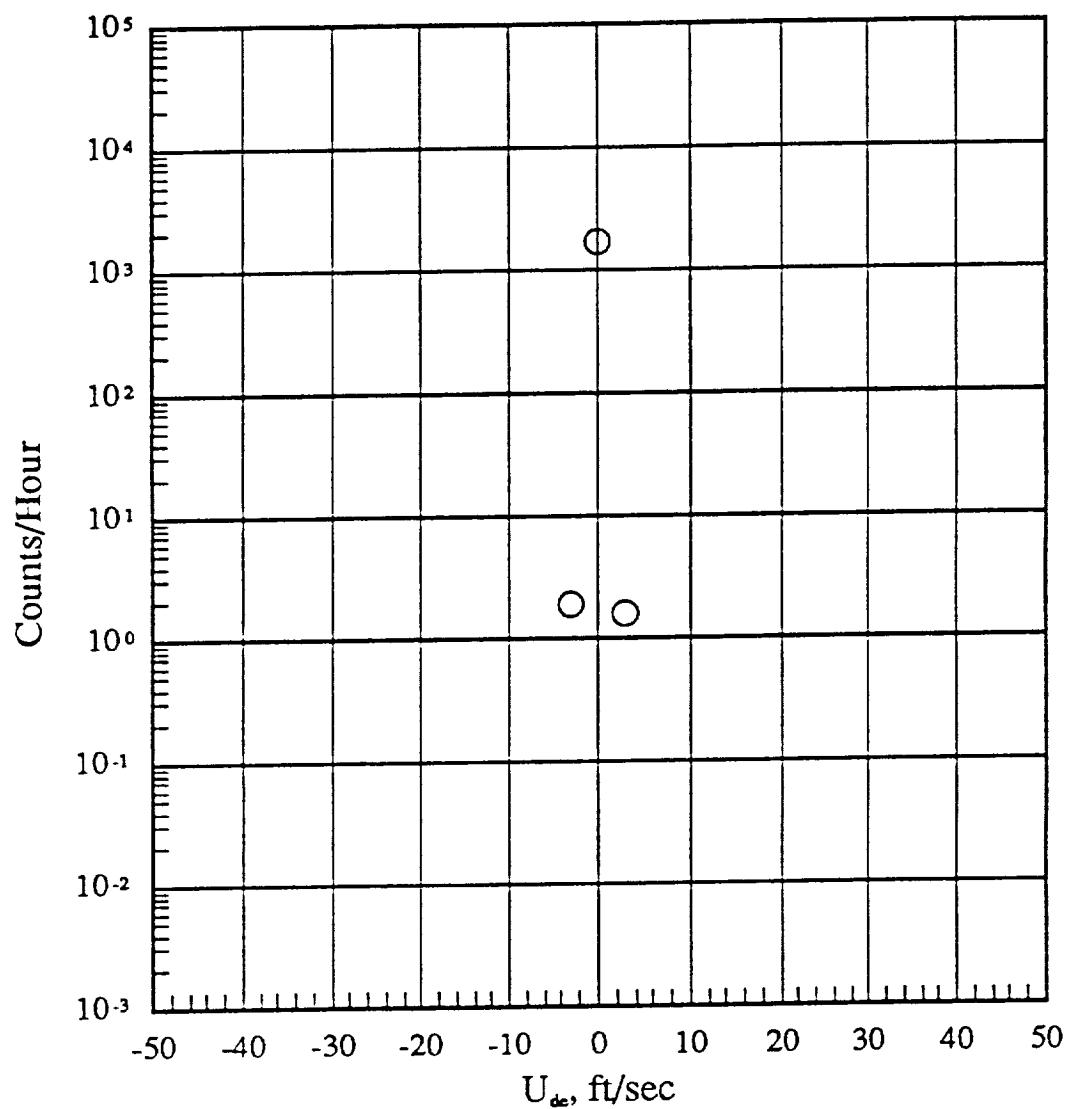
Figure 15.- Continued.



(i) 34500 to 39500 feet altitude

Figure 15.- Continued.

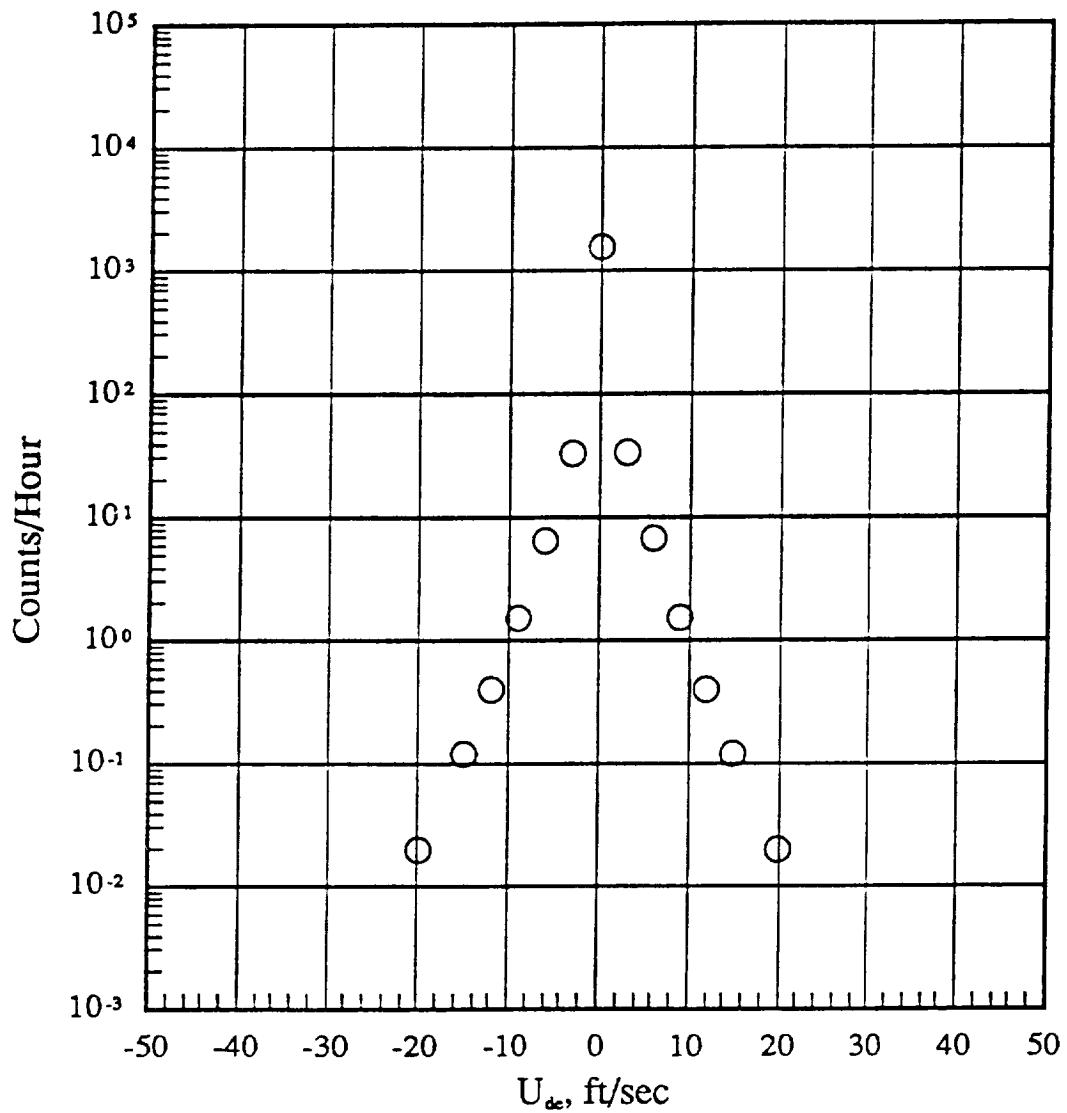
Total Flights 914  
 Total Hours 3.15  
 Total Miles 1545



(j) 39500 to 44500 feet altitude

Figure 15.- Continued.

Total Flights 914  
 Total Hours 1619.24  
 Total Miles 708384



(k) -500 to 44500 feet altitude

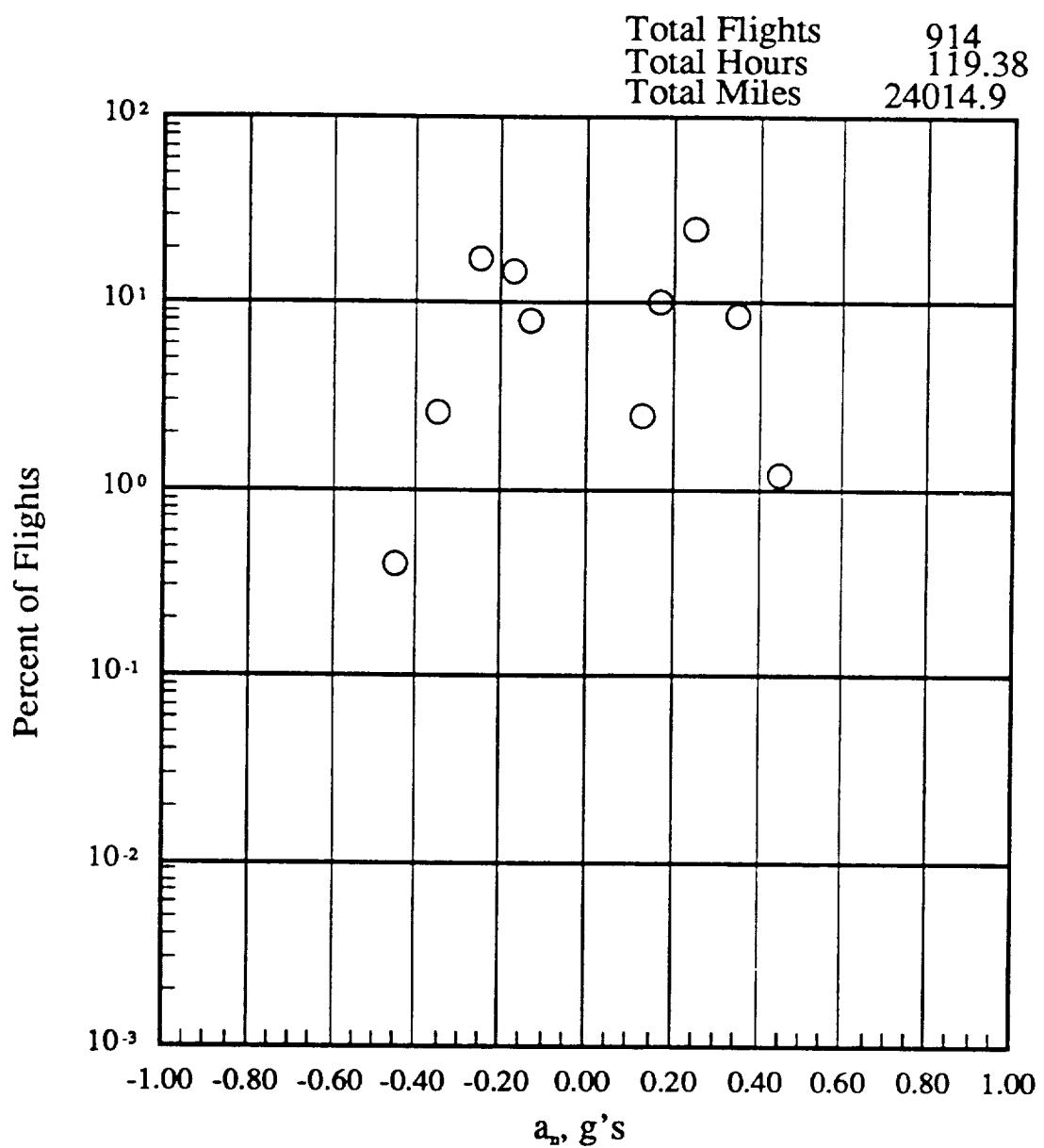
Figure 15.- Concluded

PRESSURE ALTITUDE BANDS

MAXIMUM $a_n$ LEVEL FOR EACH FLIGHT $g'$ 's FROM	PRESSURE ALTITUDE BANDS									
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	1.80	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0
.80	1.00	0	0.1	0.1	0	0	0	0	0	0.2
.70	0.80	0	0.1	0	0	0	0	0	0	0.1
.60	0.70	0	0.2	0	0.1	0	0	0	0	0.4
.50	0.60	0	0.2	0.4	0.2	0	0	0.1	0	1.1
.40	0.50	1.2	1.3	0.9	0.2	0.1	0.1	0.3	0.2	4.4
.30	0.40	8.6	4.0	2.1	1.4	0.7	0.1	0.2	0.8	17.9
.20	0.30	25.1	11.9	5.6	2.5	0.8	1.1	1.3	3.6	51.9
.15	0.20	10.2	4.0	1.8	1.0	0.2	0.2	0.9	0.9	19.1
.10	0.15	2.5	1.4	0.5	0.1	0.1	0.1	0	0	4.8
.05	0.10	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
-.05	-.10	0	0	0	0	0	0	0	0	0
-.10	-.15	8.1	3.5	2.1	0.7	0.7	0.2	0.3	1.2	16.7
-.15	-.20	14.9	5.9	3.6	1.4	0.7	0.8	0.9	2.0	30.1
-.20	-.30	17.4	6.5	5.9	2.5	1.2	1.6	2.3	3.4	40.8
-.30	-.40	2.6	1.9	1.9	0.8	0	0.1	0.9	0.5	8.6
-.40	-.50	9.4	0.7	0.4	0.1	0.2	0	0.1	0.3	2.3
-.50	-.60	0	0.2	0.3	0.2	0	0	0	0	0.8
-.60	-.70	0	0.2	0	0.1	0	0	0.1	0	0.4
-.70	-.80	0	0.1	0	0	0	0	0	0	0.1
-.80	-.90	0	0	0	0	0	0.1	0	0	0.1
-.90	-.100	0	0	0	0	0	0	0	0	0
-.100	-.120	0	0	0	0	0	0	0	0	0
-.120	-.140	0	0	0	0	0	0	0	0	0
-.140	-.160	0	0	0	0	0	0	0	0	0
-.160	-.180	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.94	31445.86	36596.71	52344.5	131369.93	363808.56	1545.14	708383.64
TOTAL FLIGHTS										
										914

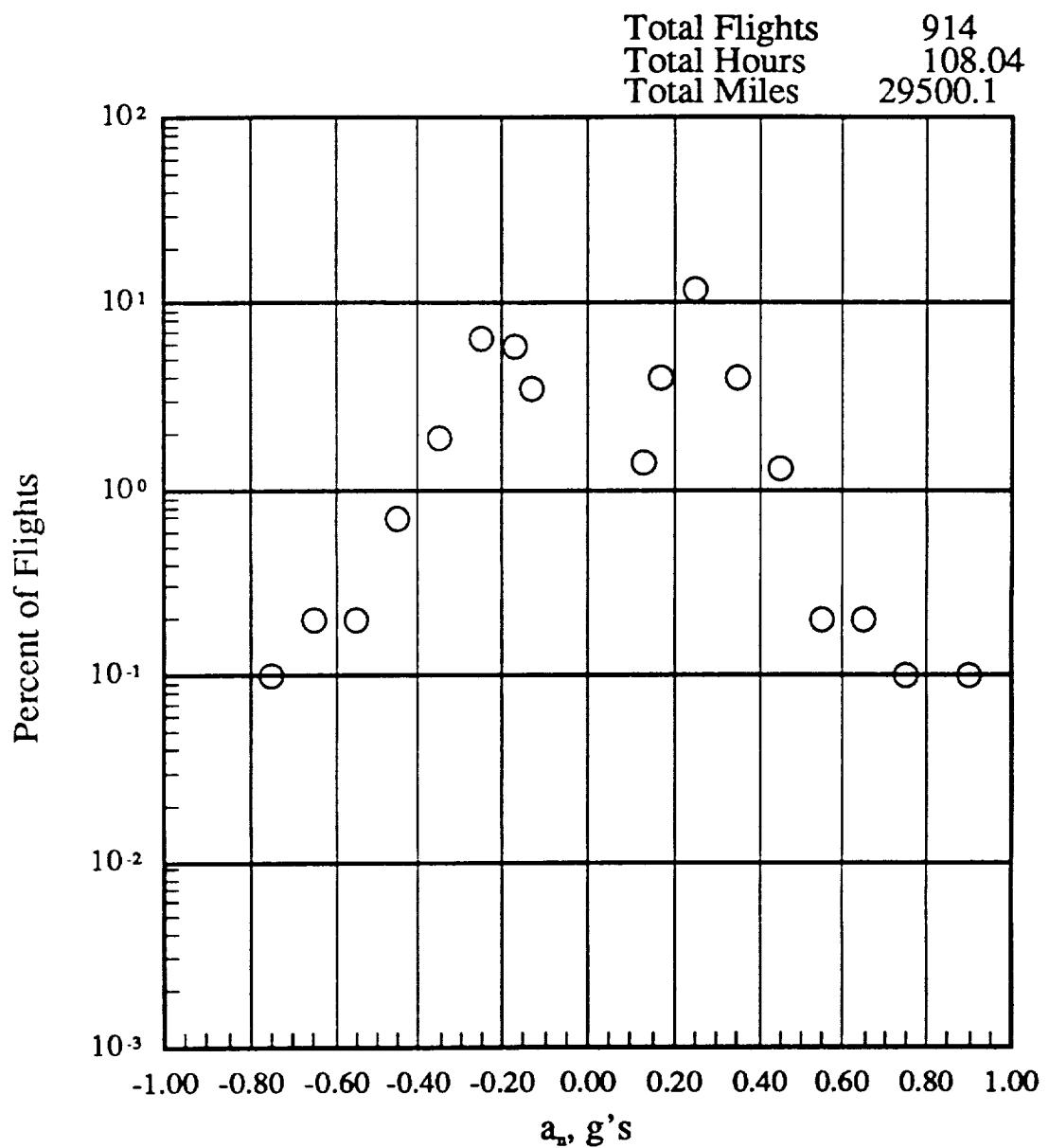
(a) Percent of flights where peak positive and negative  $a_n$  per flight occurs within pressure altitude bands, any flap

Figure 16.- Peak positive and negative  $a_n$  vs altitude.



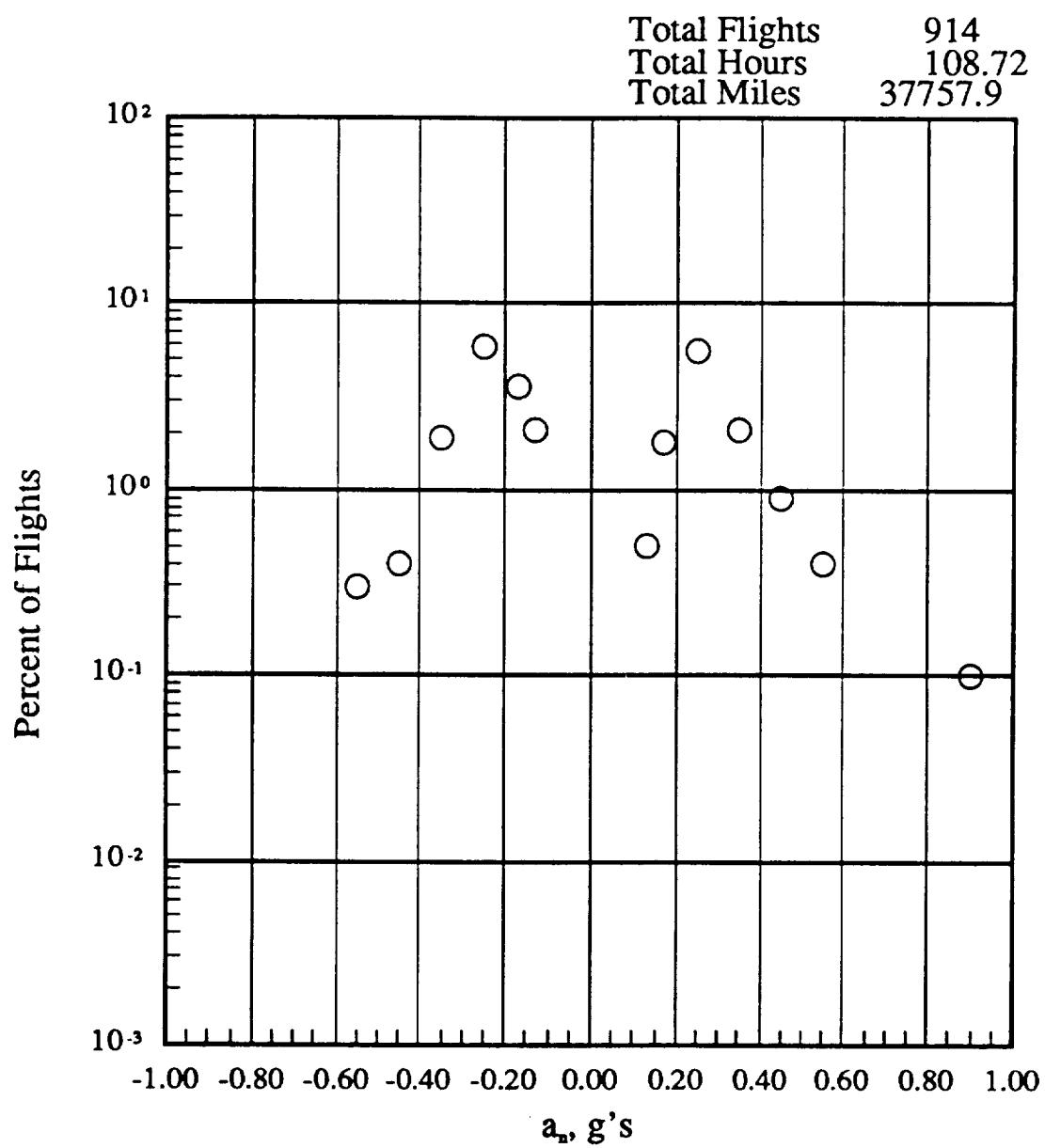
(b) -500 to 4500 feet altitude

Figure 16.- Continued.



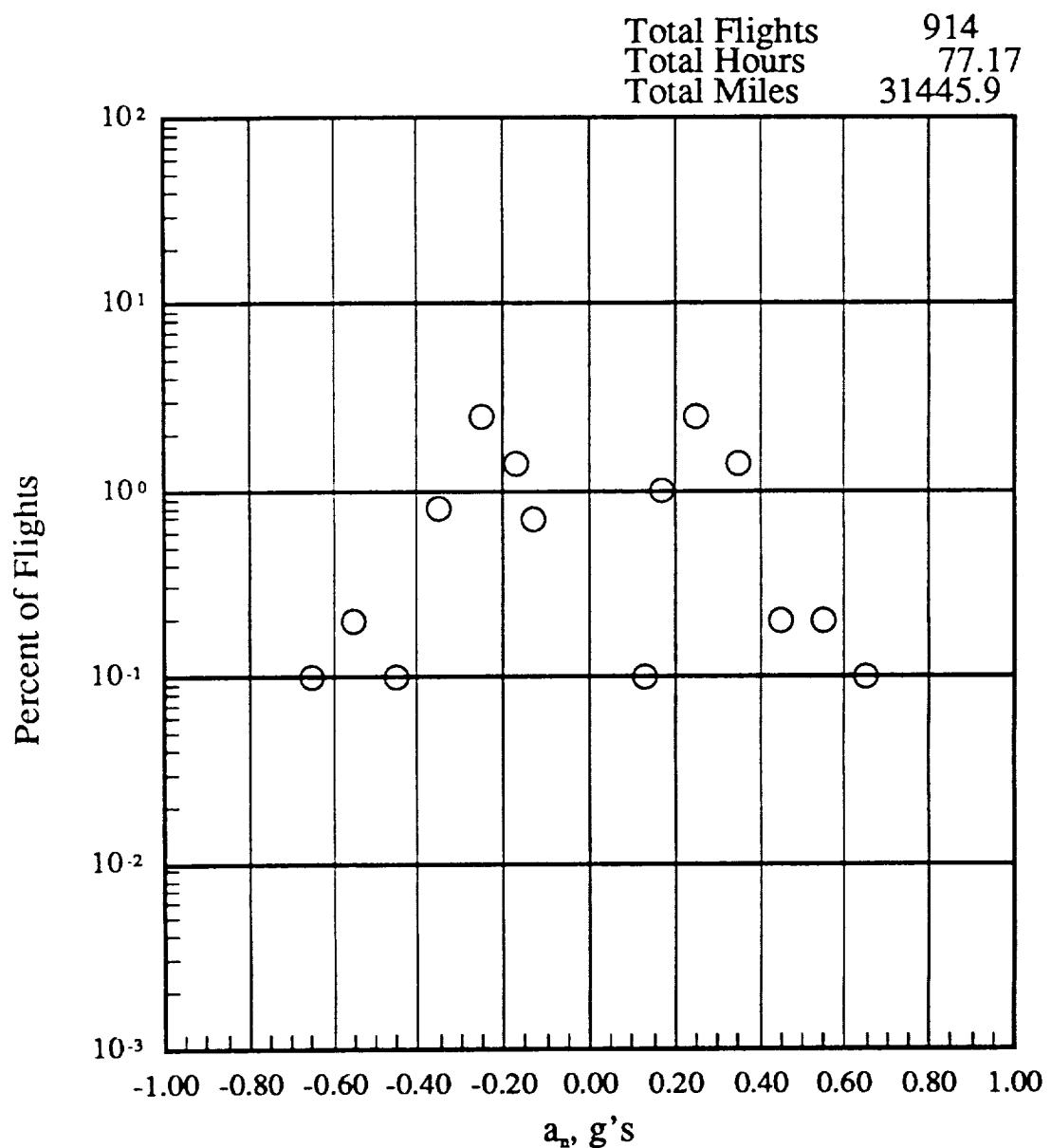
(c) 4500 to 9500 feet altitude

Figure 16.- Continued.



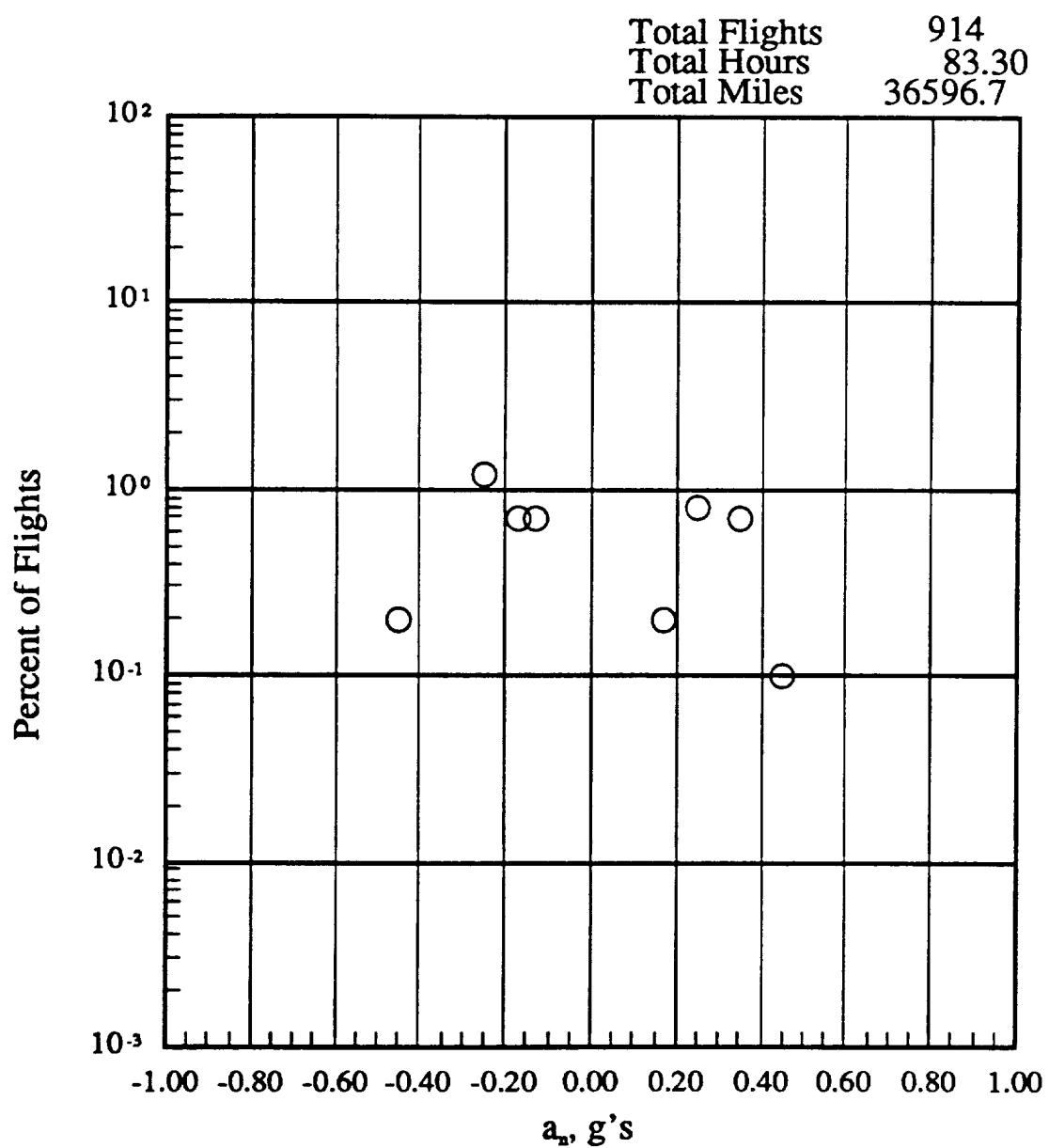
(d) 9500 to 14500 feet altitude

Figure 16.- Continued.



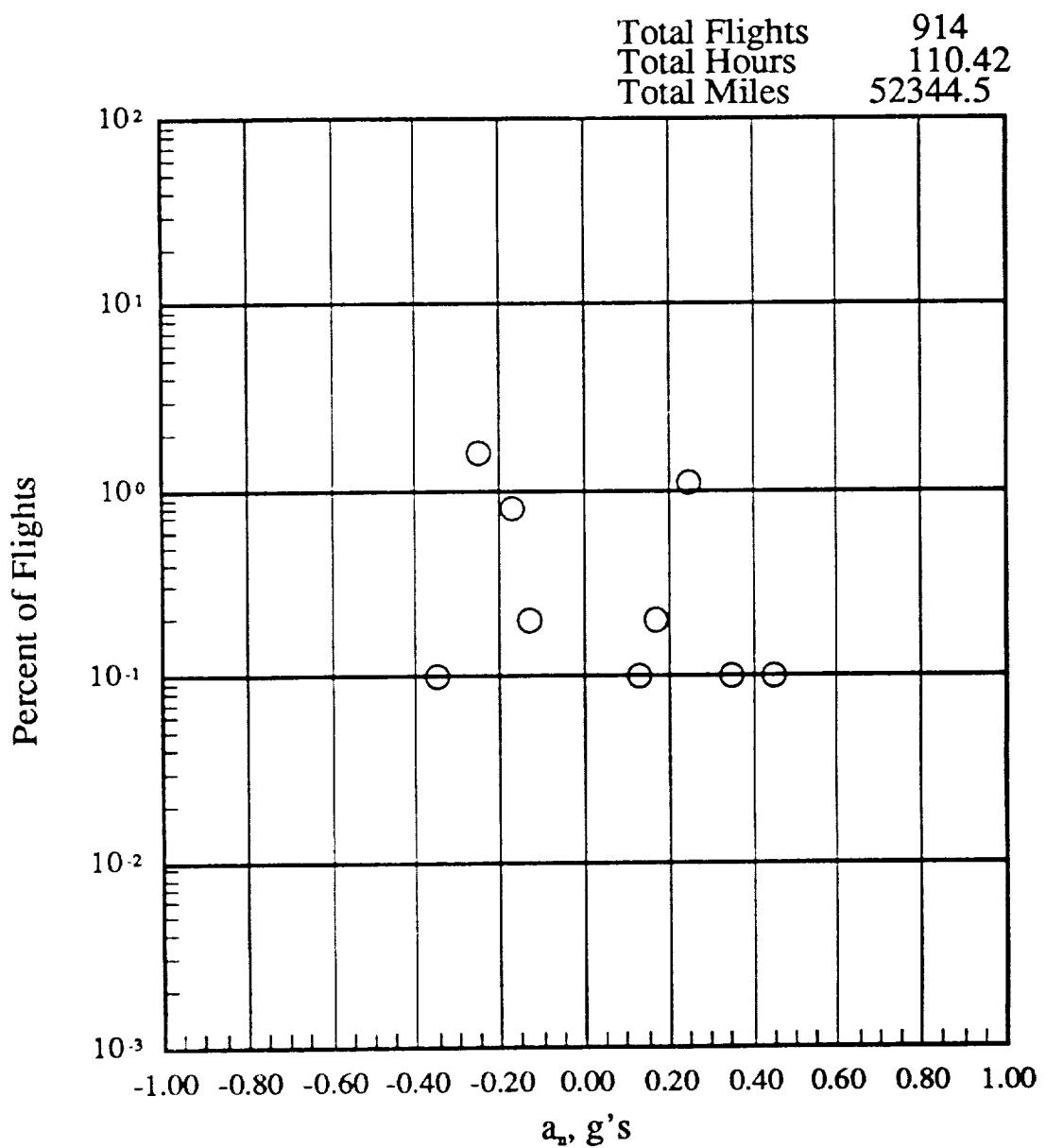
(e) 14500 to 19500 feet altitude

Figure 16.- Continued.



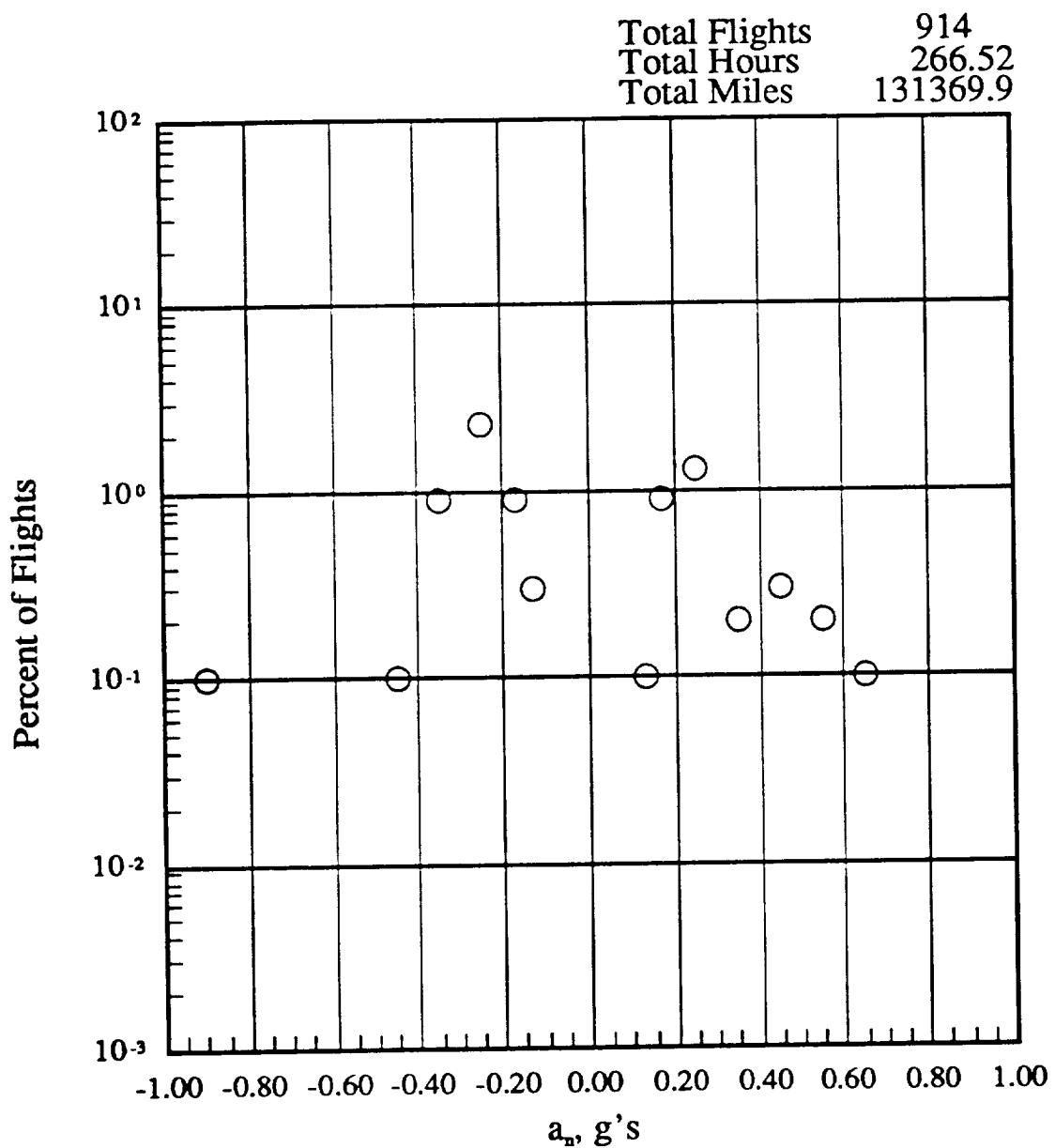
(f) 19500 to 24500 feet altitude

Figure 16.- Continued.



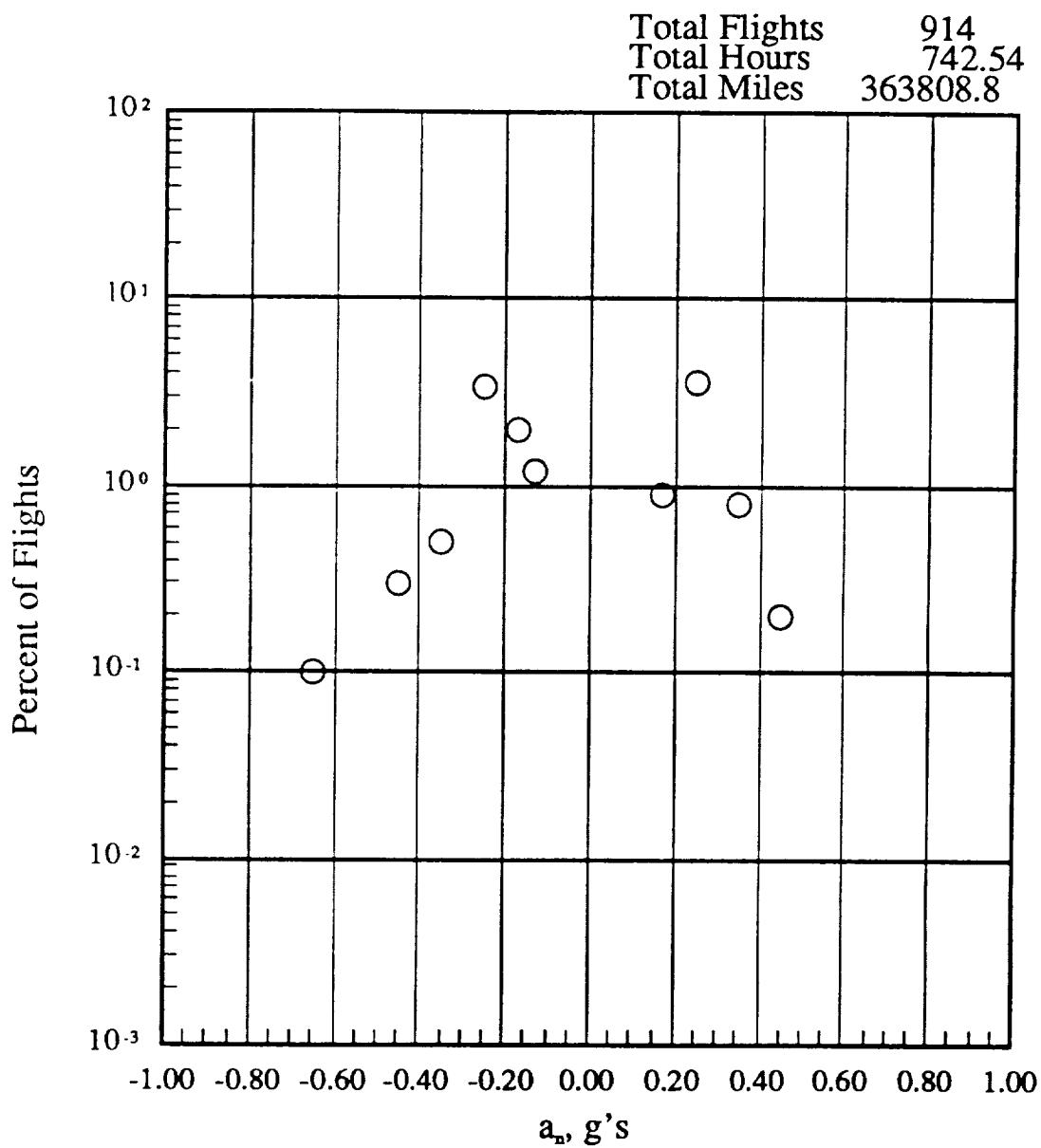
(g) 24500 to 29500 feet altitude

Figure 16.- Continued.



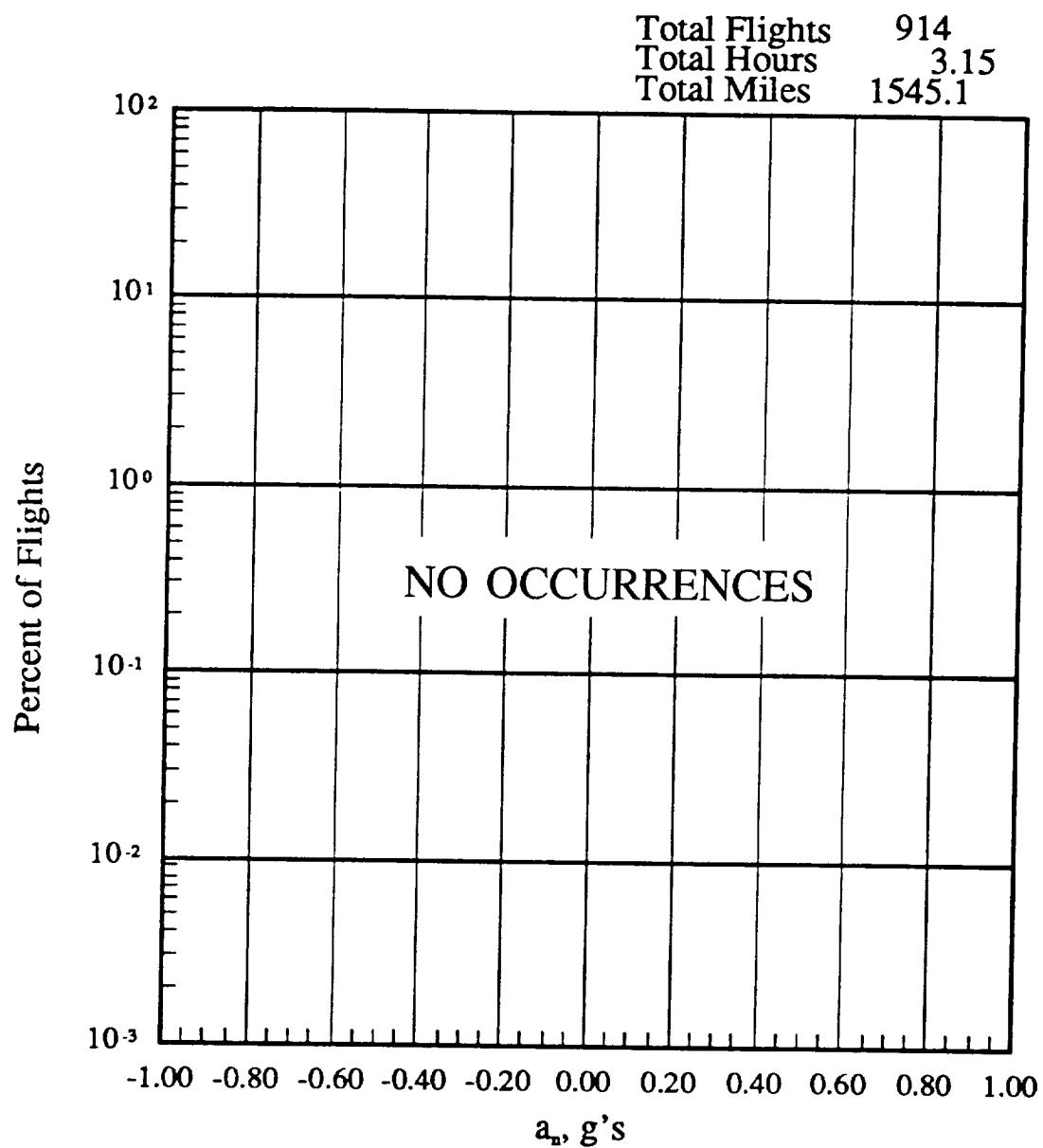
(h) 29500 to 34500 feet altitude

Figure 16.- Continued.



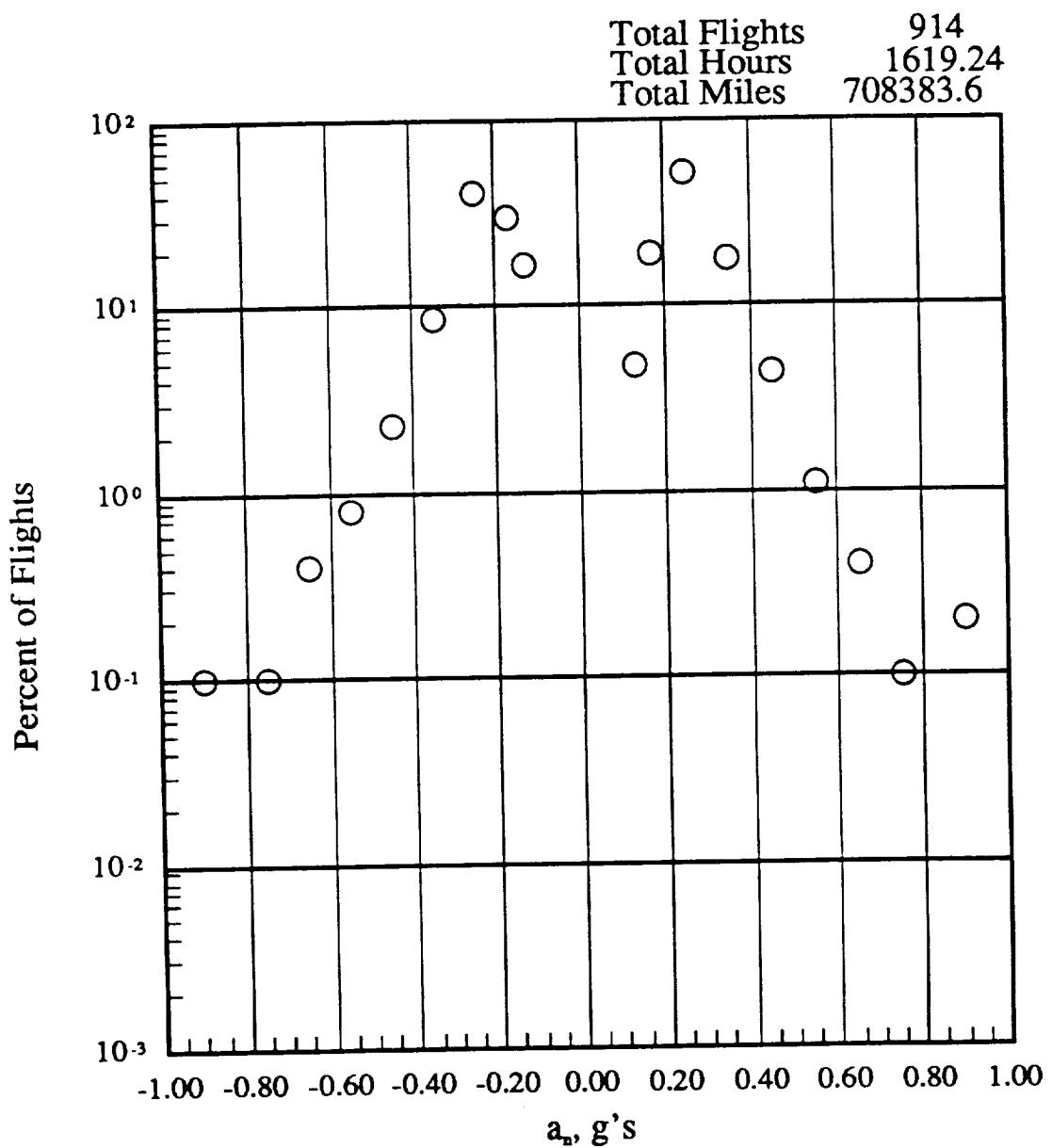
(i) 34500 to 39500 feet altitude

Figure 16.- Continued.



(j) 39500 to 44500 feet altitude

Figure 16.- Continued.



(k) -500 to 44500 feet altitude

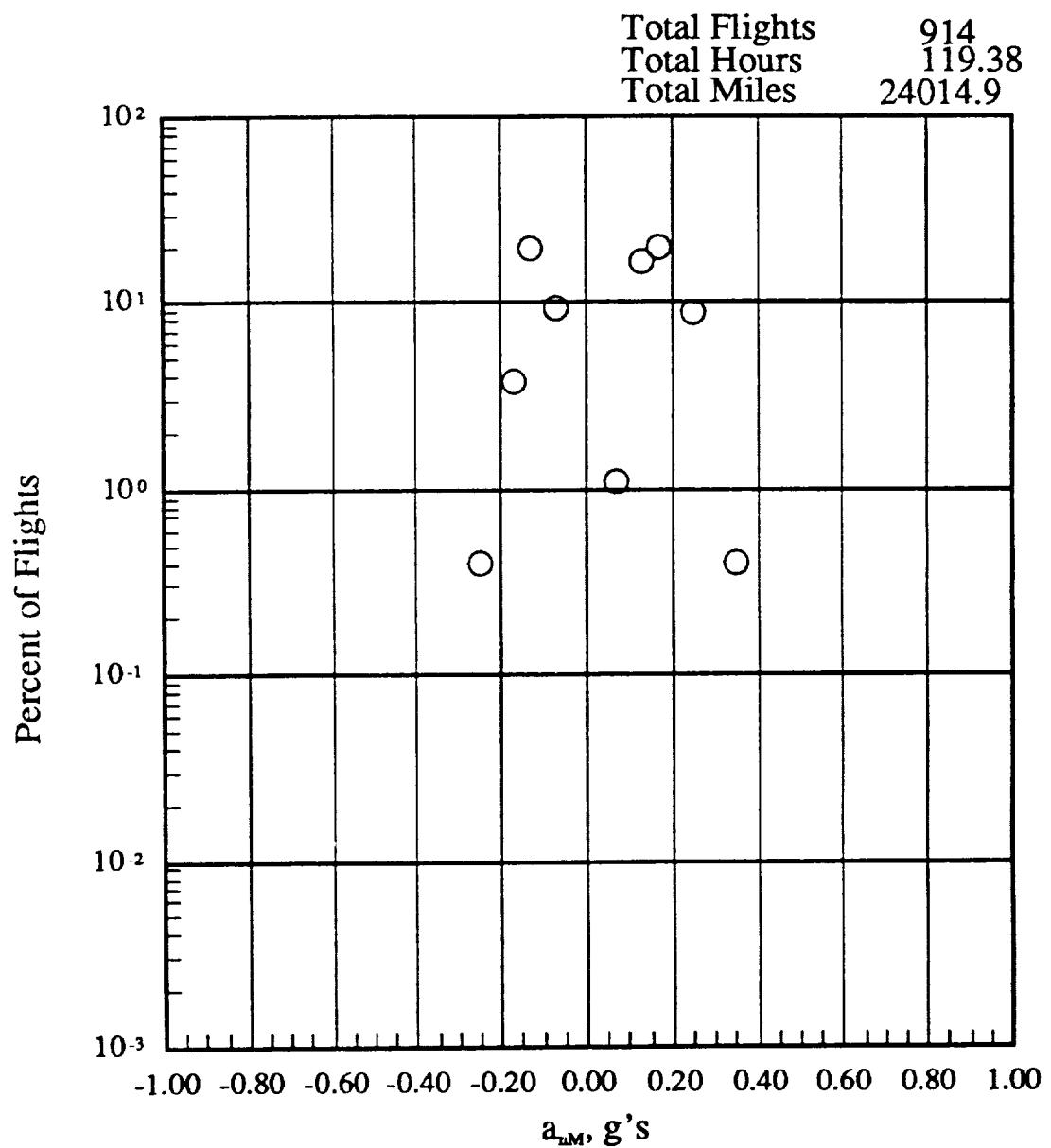
Figure 16.- Concluded.

MAXIMUM $a_{nM}$	LEVEL FOR EACH FLIGHT	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 49500 FT	
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0
.70	.80	0	0	0	0	0	0	0	0	0	0	0
.60	.70	0	0	0	0	0	0	0	0	0	0	0
.50	.60	0	0	0	0	0	0	0	0	0	0	0
.40	.50	0	0	0.1	0	0	0	0	0	0	0	0.1
.30	.40	0.4	0.7	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
.20	.30	8.9	5.9	1.5	1.0	0.4	0.4	0.3	0.2	0.2	0.2	1.8
.15	.20	19.9	12.3	4.2	1.4	1.2	0.5	1.0	0.3	0.3	0.3	18.7
.10	.15	16.7	11.6	4.6	1.4	0.2	0.1	0.3	0.2	0.2	0.2	40.8
.05	.10	1.1	1.2	0.5	0.3	0	0	0.1	0.1	0.1	0.1	35.2
												3.4
-.05	-.10	9.4	4.7	5.0	1.8	0.5	0.5	0.9	0.9	1.0	0	24.2
-.10	-.15	19.7	16.1	11.2	6.0	2.1	1.1	1.5	1.4	0	0	59.1
-.15	-.20	3.8	3.5	3.1	1.6	0.8	0.4	0.9	0.3	0	0	14.4
-.20	-.30	0.4	0.7	0.3	0.2	0.1	0.1	0.2	0.2	0	0	2.3
-.30	-.40	0	0	0	0	0	0	0	0	0	0	0
-.40	-.50	0	0	0	0	0	0	0	0	0	0	0
-.50	-.60	0	0	0	0	0	0	0	0	0	0	0
-.60	-.70	0	0	0	0	0	0	0	0	0	0	0
-.70	-.80	0	0	0	0	0	0	0	0	0	0	0
-.80	-.90	0	0	0	0	0	0	0	0	0	0	0
-.90	-.100	0	0	0	0	0	0	0	0	0	0	0
-.100	-.120	0	0	0	0	0	0	0	0	0	0	0
-.120	-.140	0	0	0	0	0	0	0	0	0	0	0
-.140	-.160	0	0	0	0	0	0	0	0	0	0	0
-.160	-.180	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS $\pm$ ALT		119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24	
FLIGHT MILES $\pm$ ALT		24014.89	29500.10	37757.94	31445.86	36596.71	52344.52	131369.93	363808.56	1545.14	708383.64	
												914.0

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OF POOR QUALITY

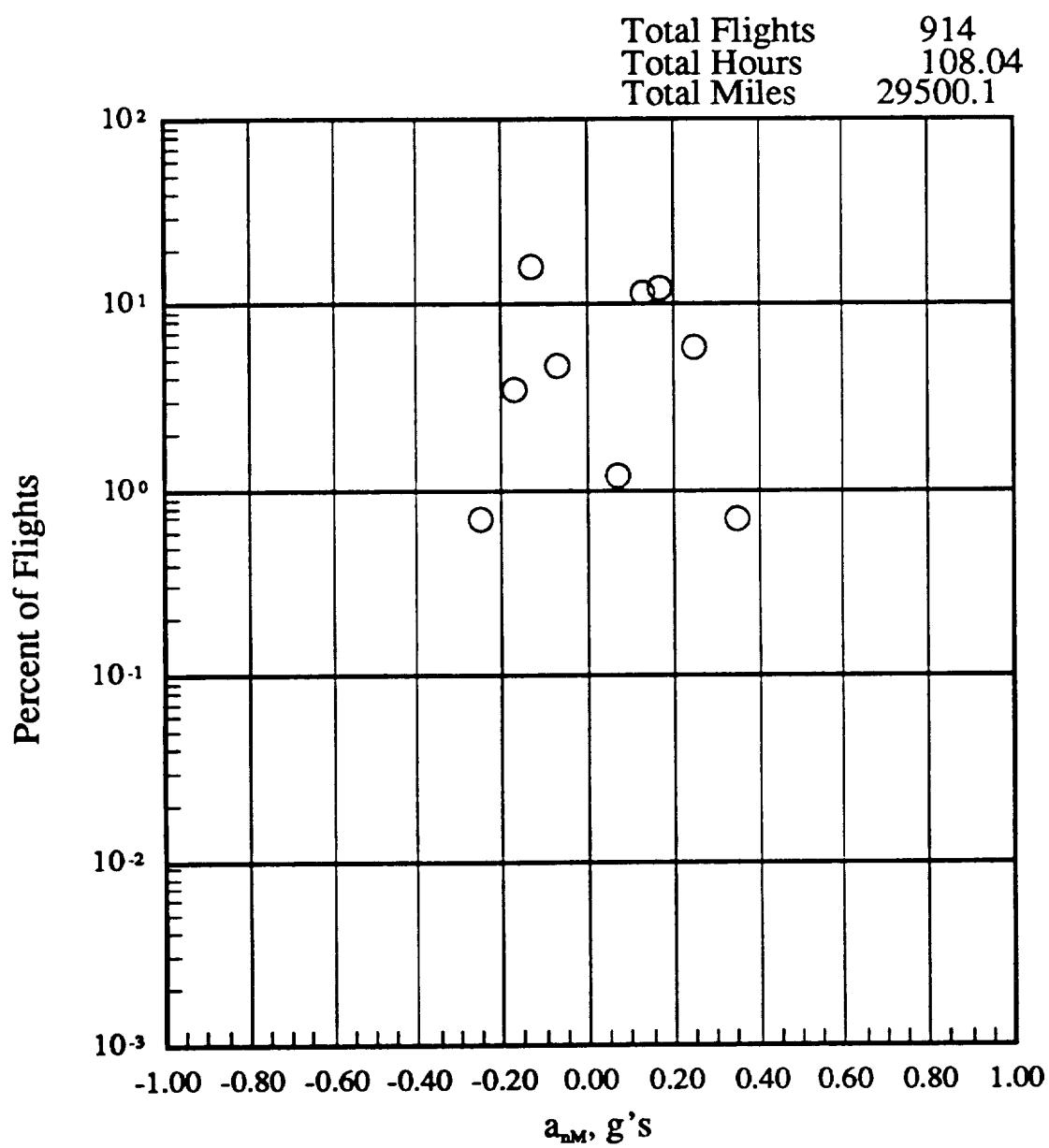
(a) Percent of flights where peak positive and negative  $a_{nM}$  per flight occurs within pressure altitude bands, any flap

Figure 17.- Peak Positive and negative  $a_{nM}$  vs. altitude.



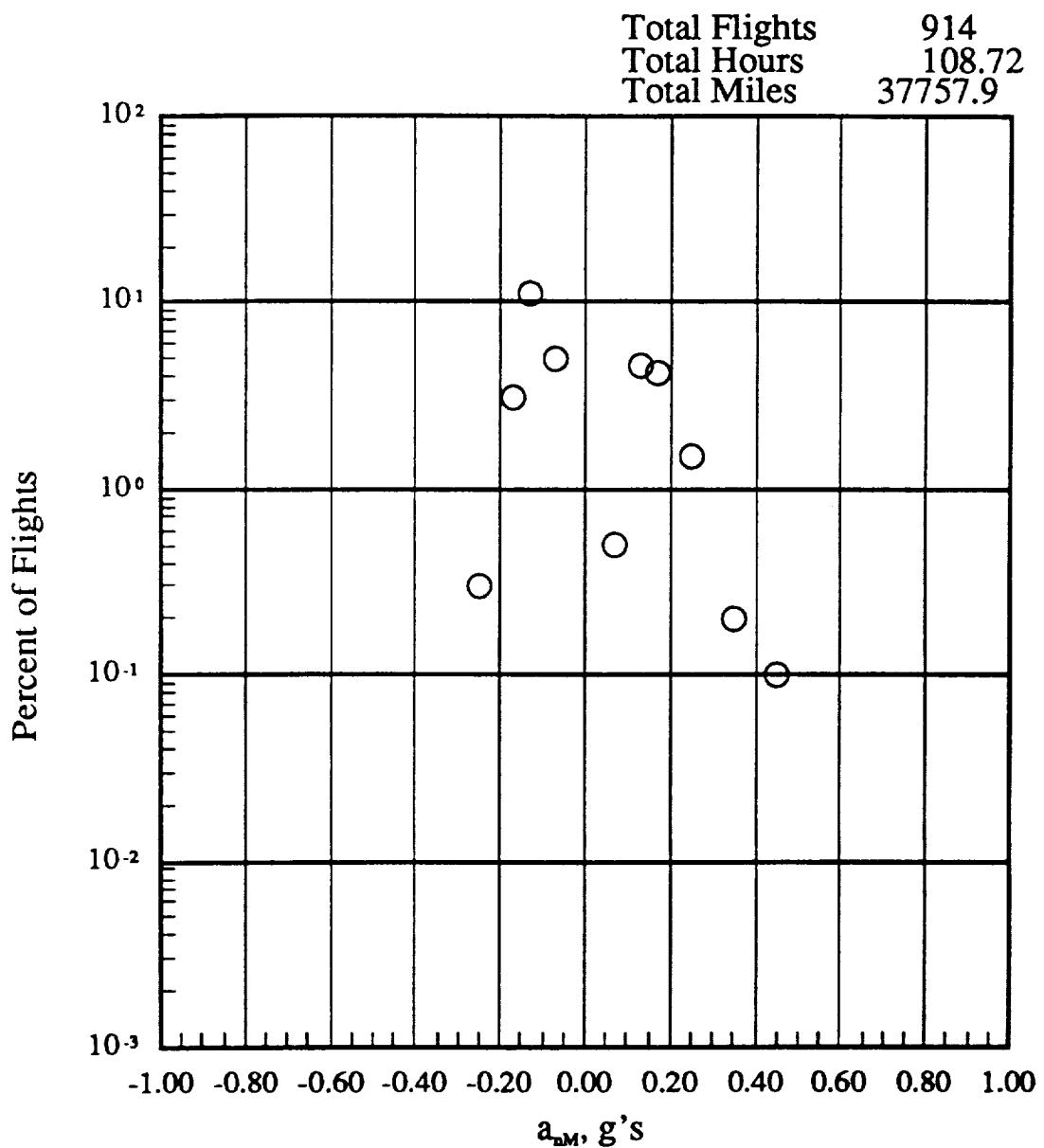
(b) -500 to 4500 feet altitude

Figure 17.- Continued.



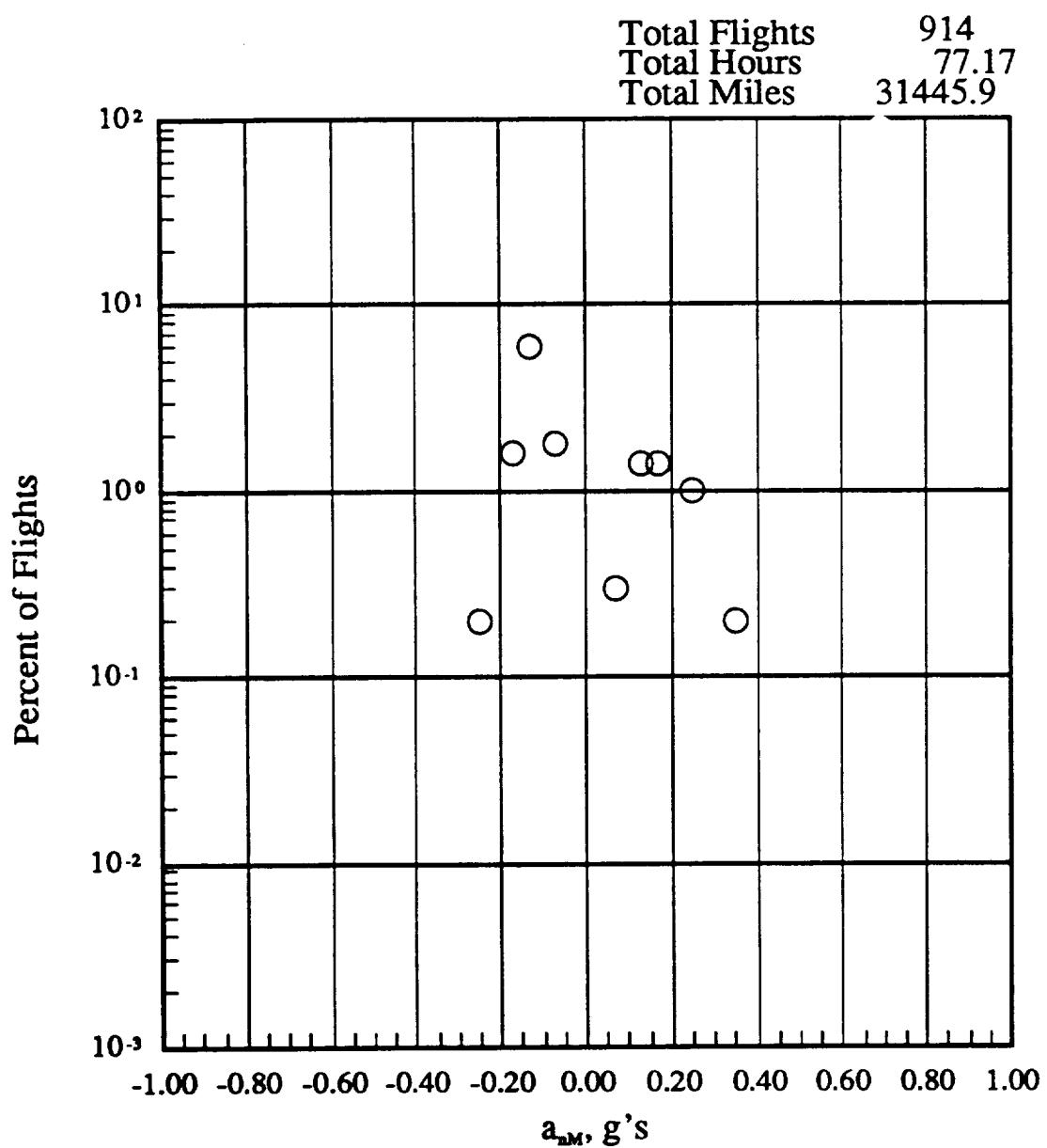
(c) 4500 to 9500 feet altitude

Figure 17.- Continued.



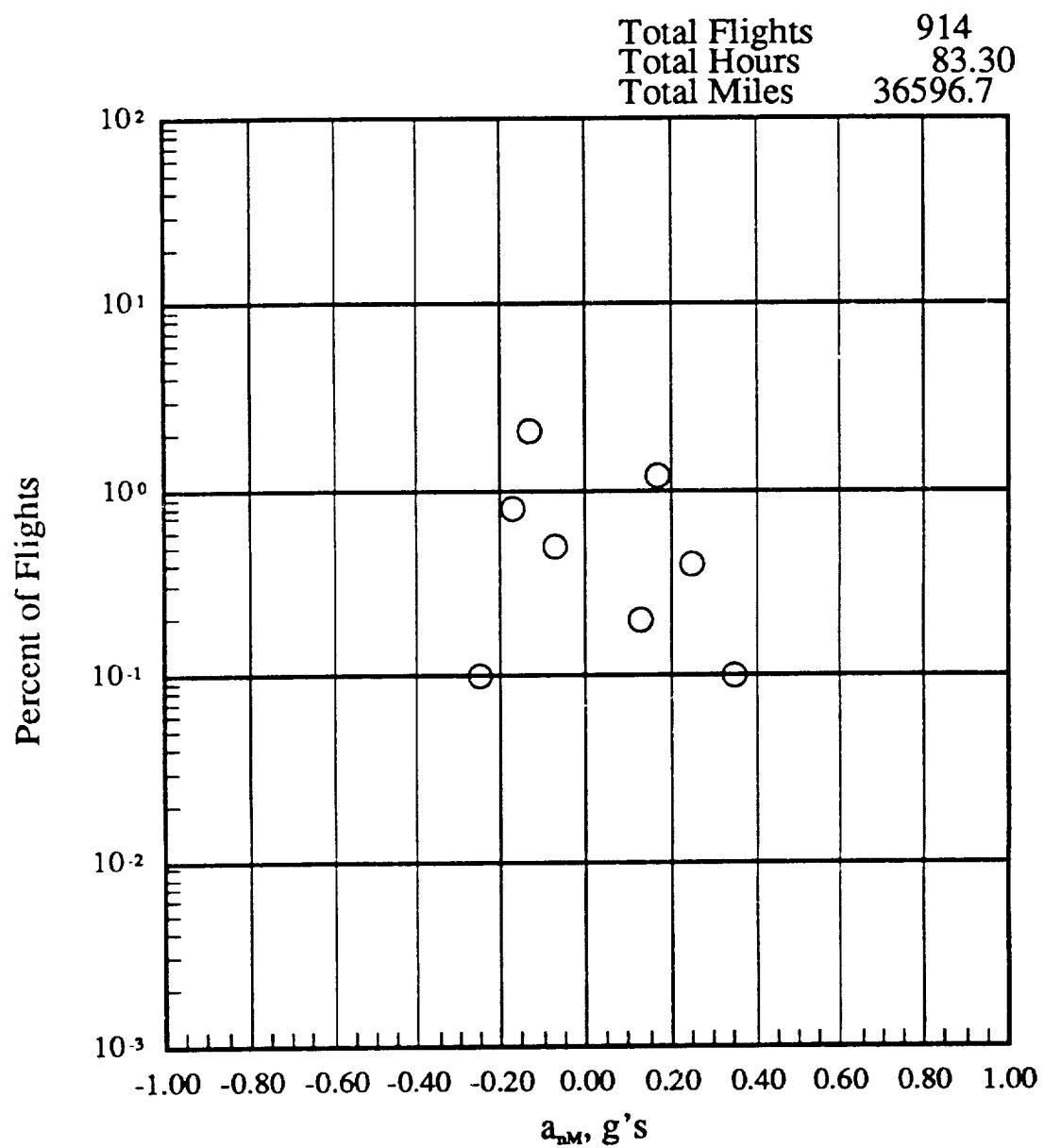
(d) 9500 to 14500 feet altitude

Figure 17.- Continued.



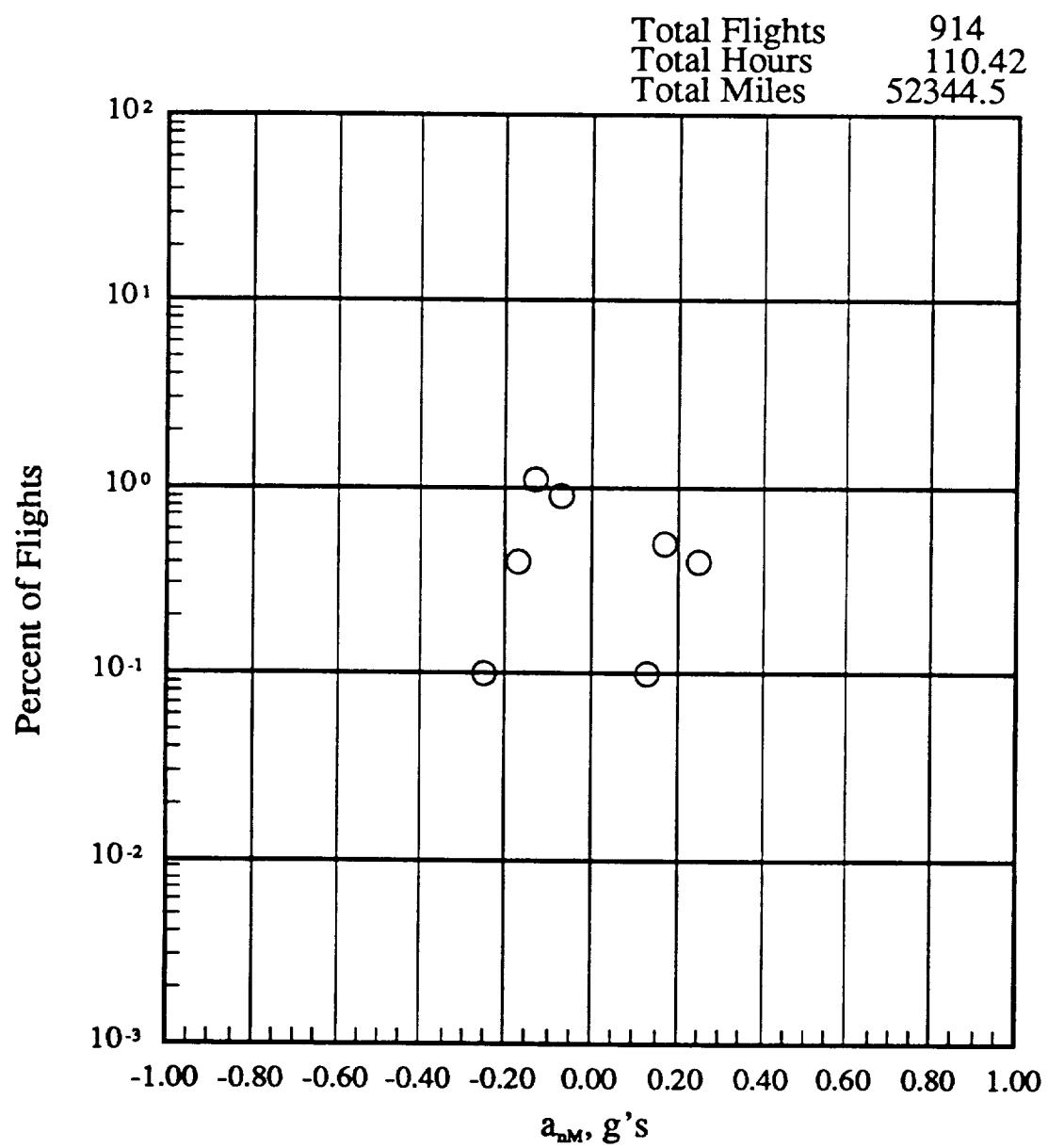
(e) 14500 to 19500 feet altitude

Figure 17.- Continued.



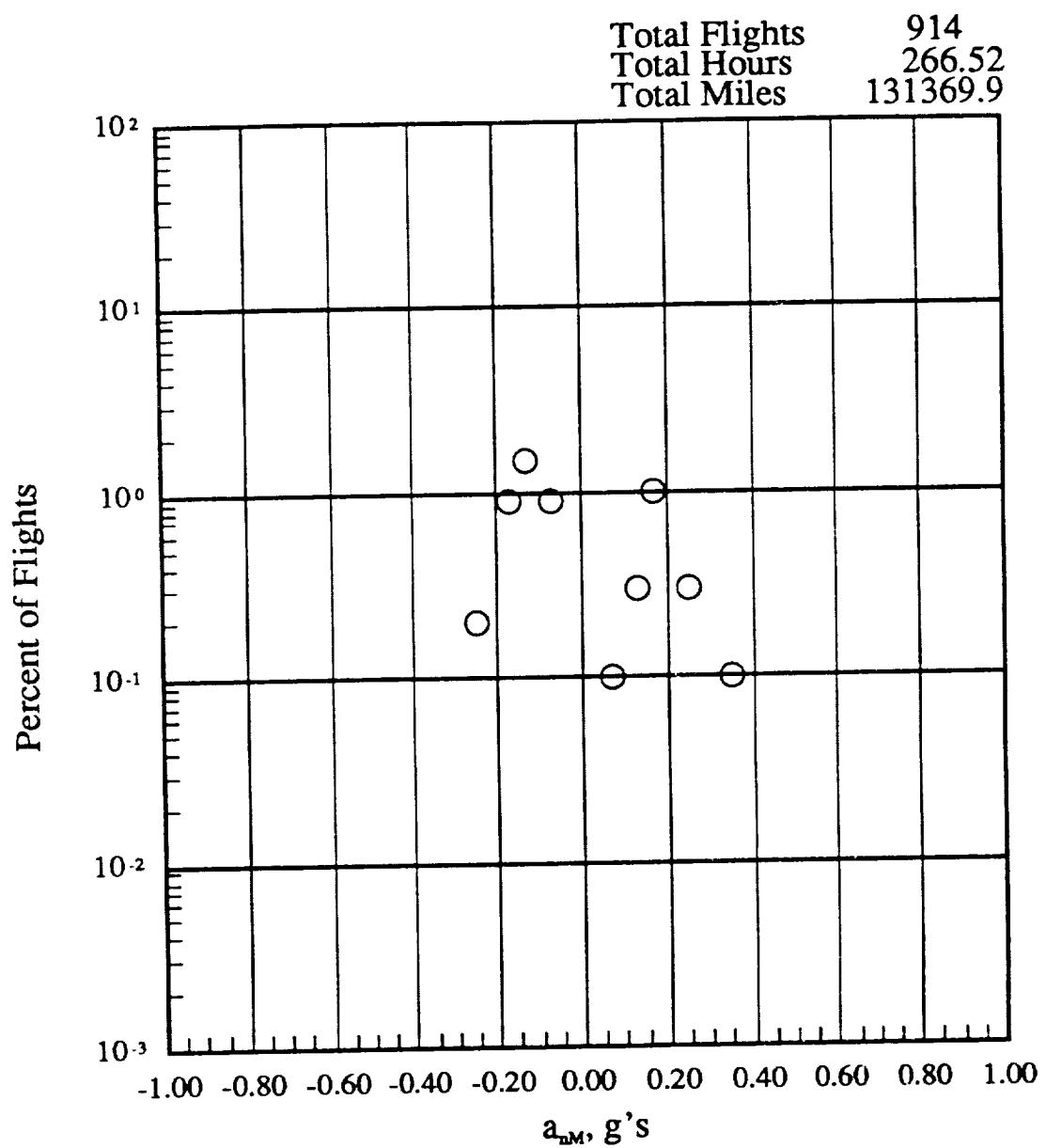
(f) 19500 to 24500 feet altitude

Figure 17.- Continued.



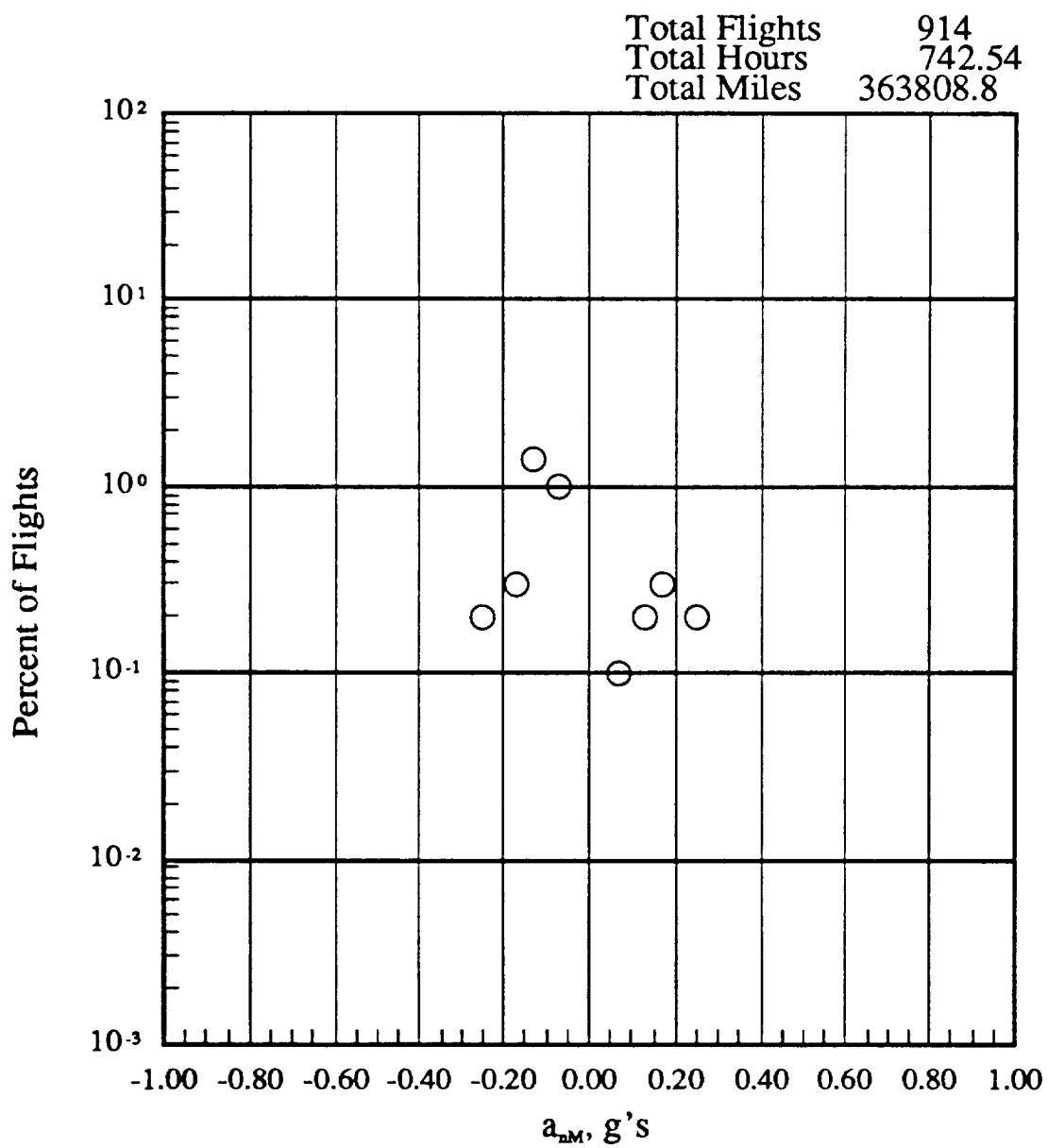
(g) 24500 to 29500 feet altitude

Figure 17.- Continued.



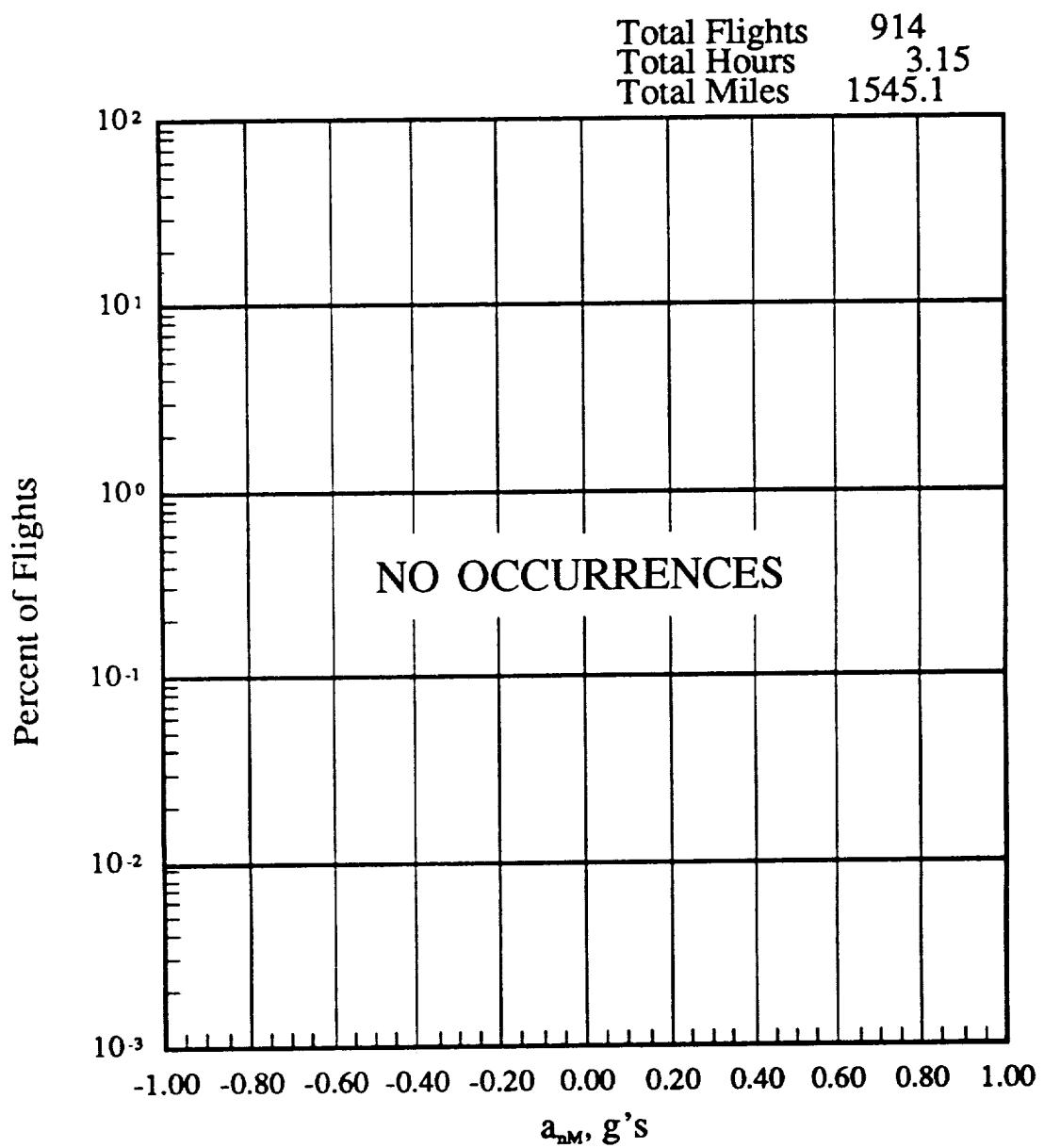
(h) 29500 to 34500 feet altitude

Figure 17.- Continued.



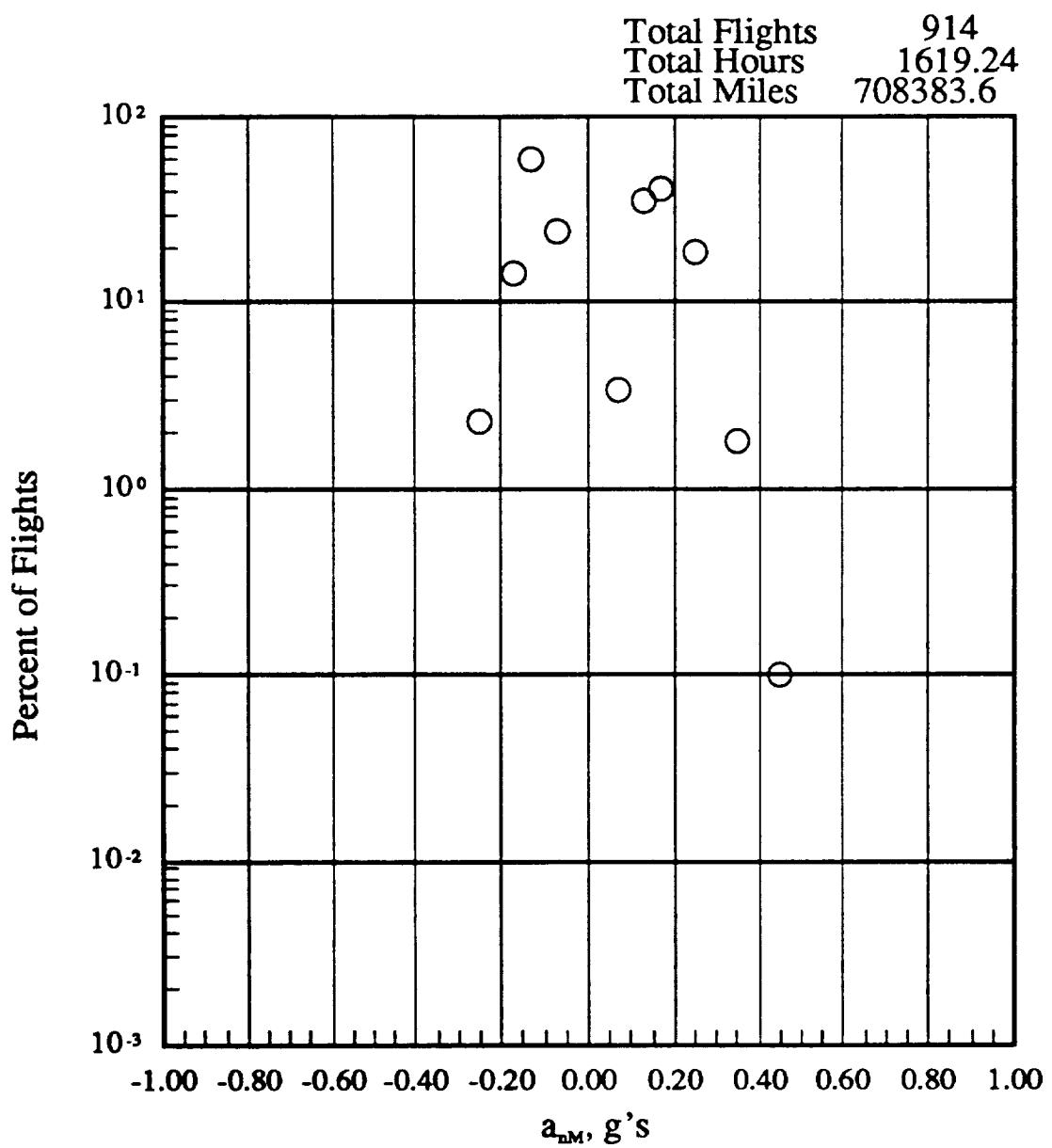
(i) 34500 to 39500 feet altitude

Figure 17.- Continued.



(j) 39500 to 44500 feet altitude

Figure 17.- Continued.



(k) -500 to 44500 feet altitude

Figure 17.- Concluded.

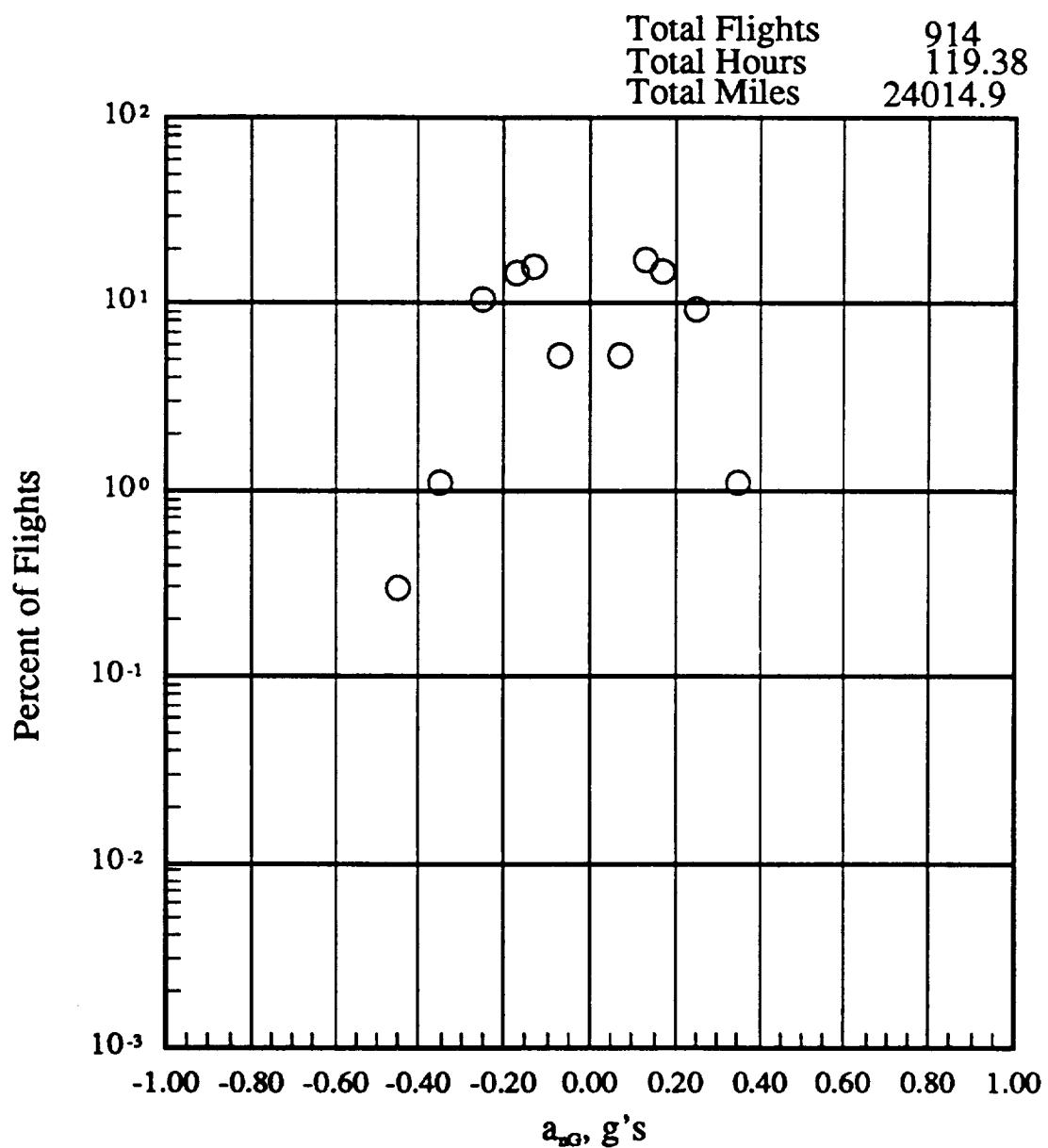
PRESSURE ALTITUDE BANDS

MAXIMUM $a_{nG}$ LEVEL FOR EACH FLIGHT	-500 TO 4500 FT	4500 TO 5500 FT		9500 TO 14500 FT		14500 TO 19500 FT		19500 TO 24500 FT		24500 TO 29500 FT		29500 TO 34500 FT		34500 TO 39500 FT		39500 TO 44500 FT		44500 TO 44500 FT	
		g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	g's FROM TO	
.160	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.70	.80	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
.60	.70	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	
.50	.60	0	0.3	0	0.2	0	0	0	0.1	0	0	0.1	0	0	0	0	0.5	0	
.40	.50	0	0.4	0.7	0	0	0.1	0	0	0.1	0	0.8	0.3	0	0	0	1.3	5.1	
.30	.40	1.1	0.9	1.5	0.4	0	0.1	0	0	0.1	0.8	0.5	0.8	0.3	0	0	0	23.5	
.20	.30	9.4	4.5	3.3	1.6	0.8	0.5	0.5	0.8	0.5	0.8	2.6	0	0	0	0	0	30.1	
.15	.20	15.0	4.0	2.6	1.0	0.7	0.9	2.1	3.8	0	0	0	0	0	0	0	0	29.6	
.10	.15	17.3	4.0	2.3	0.7	1.4	0.7	1.6	1.6	0	0	0	0	0	0	0	0	9.4	
.05	.10	5.3	1.3	0.9	0.5	0.3	0.2	0.5	0.5	0.3	0	0	0	0	0	0	0	0	
-.05	-.10	5.3	1.9	0.5	0.4	0.2	0.1	0.5	0.8	0	0	0	0	0	0	0	0	9.7	
-.10	-.15	15.9	4.5	2.3	1.1	0.9	0.7	1.6	2.5	0	0	0	0	0	0	0	0	29.4	
-.10	-.20	14.7	3.5	2.7	1.4	0.9	0.5	1.3	3.3	0	0	0	0	0	0	0	0	28.3	
-.20	-.30	10.6	4.6	4.4	1.1	0.2	0.6	2.2	2.2	0	0	0	0	0	0	0	0	25.1	
-.30	-.40	1.1	1.3	1.0	0.5	0	0	0.4	0.5	0	0	0	0	0	0	0	0	5.0	
-.40	-.50	0.3	0.8	0.2	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0	1.5	
-.50	-.60	0	0.3	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	
-.60	-.70	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	
-.70	-.80	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	
-.80	-.100	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24									
FLIGHT MILES @ ALT	24014.89	29500.10	37757.94	31445.86	36596.71	52344.52	131369.93	363808.56	1545.14	708383.64									
TOTAL FLIGHTS																			

914

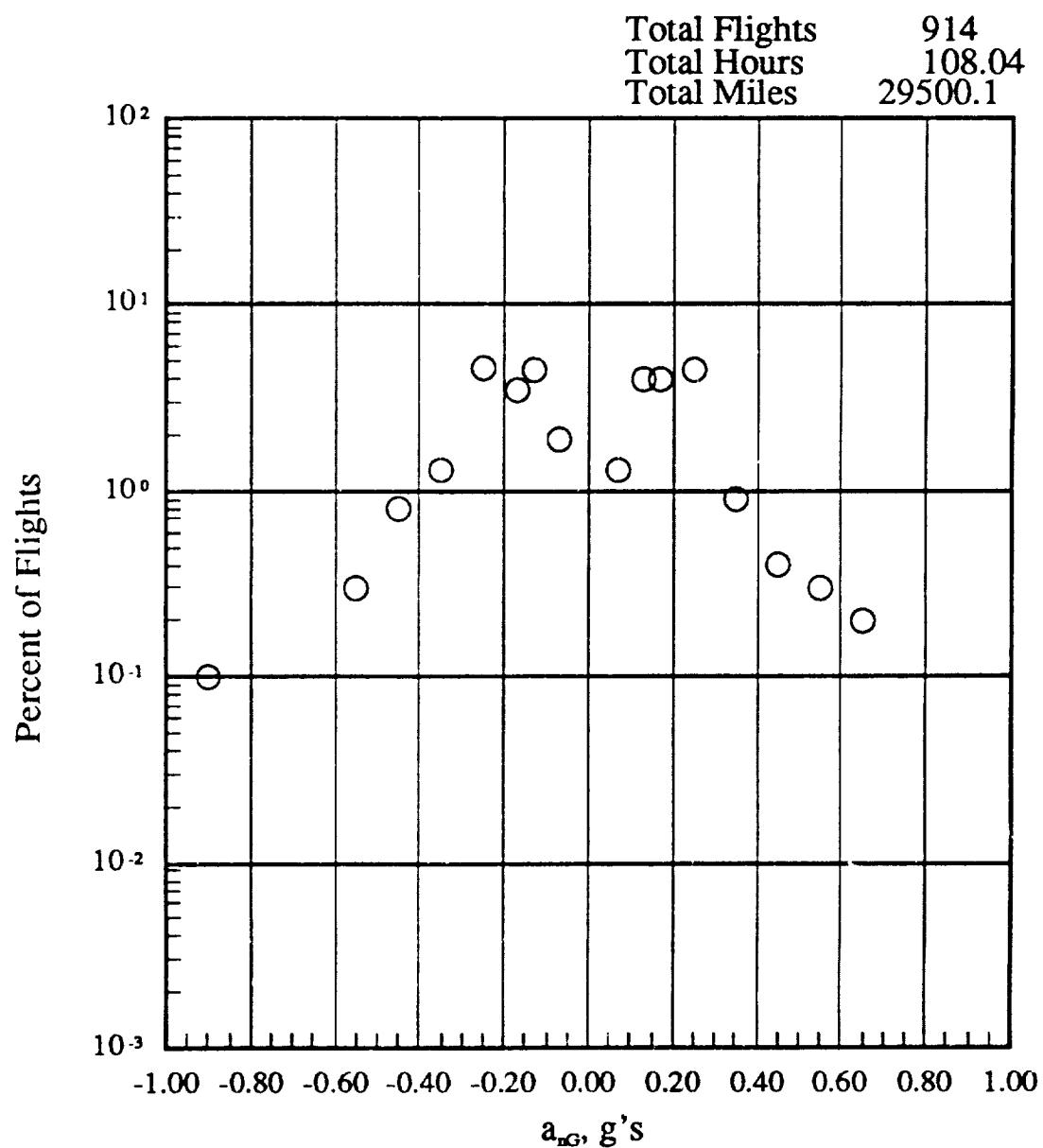
(a)  $a_{nG}$  Percent of flights where peak positive and negative  $a_{nG}$  per flight occurs within pressure altitude bands, any flap

Figure 18.- Peak positive and negative  $a_{nG}$  vs altitude.



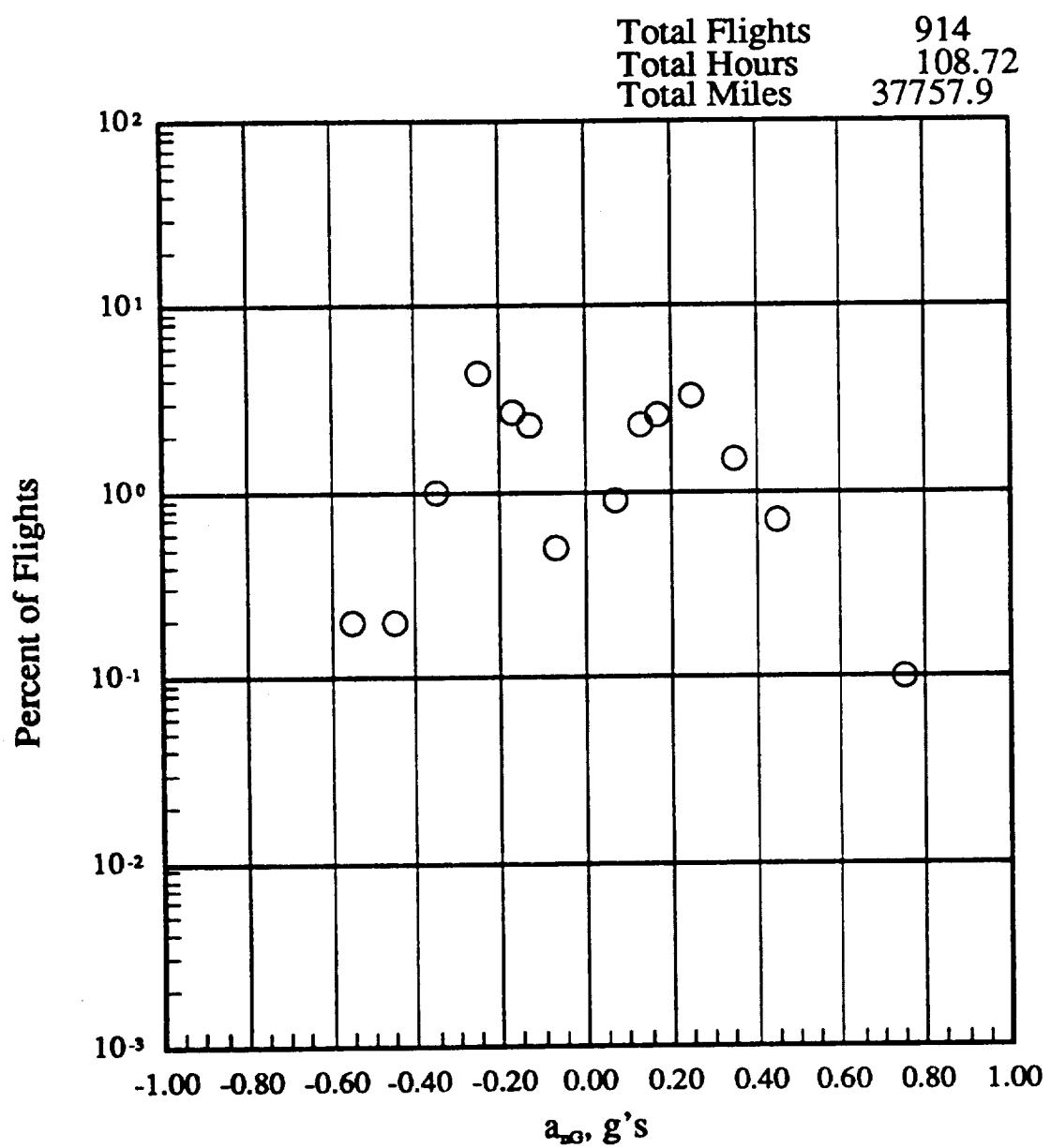
(b) -500 to 4500 feet altitude

Figure 18.- Continued.



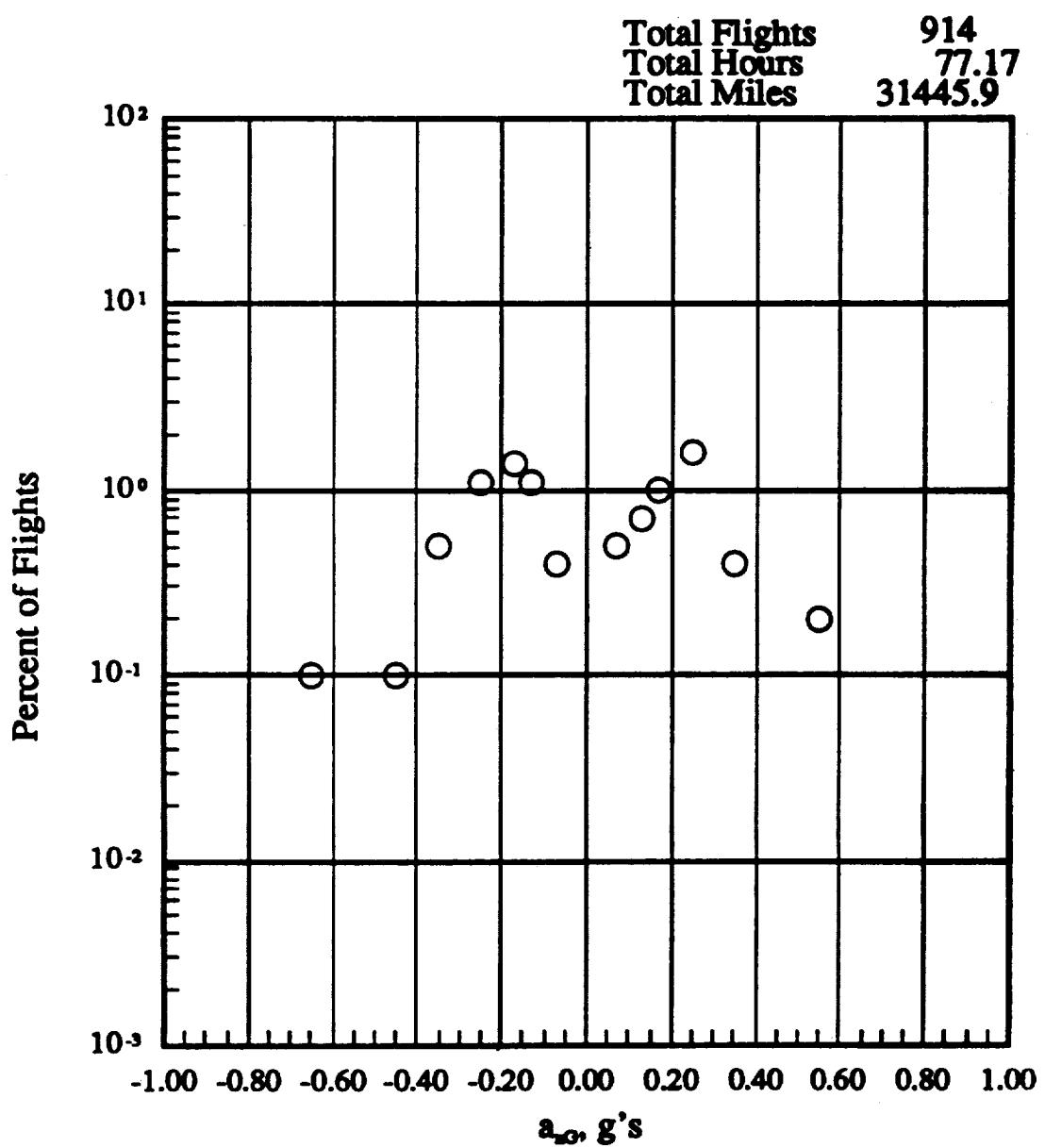
(c) 4500 to 9500 feet altitude

Figure 18.- Continued.



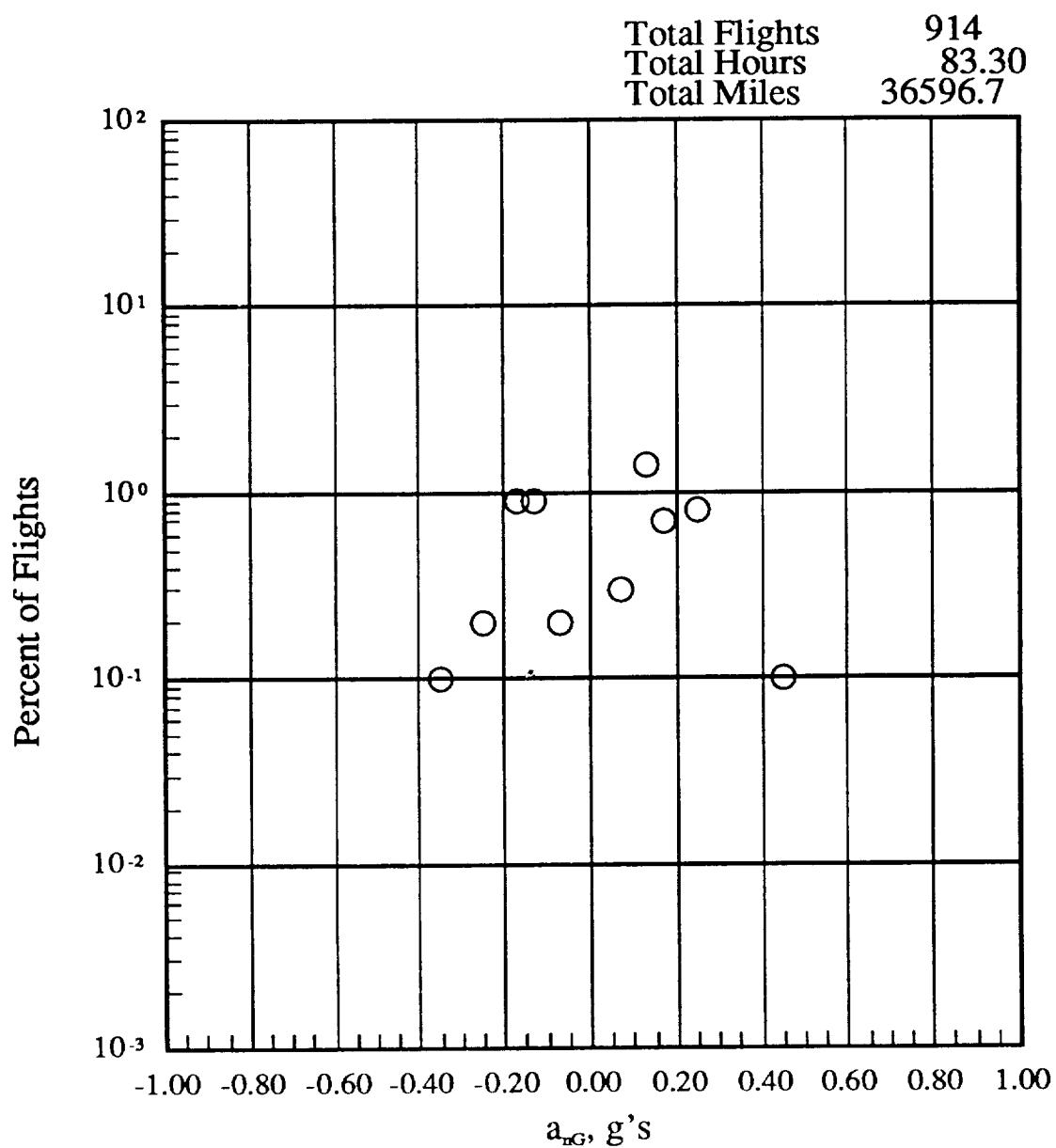
(d) 9500 to 14500 feet altitude

Figure 18.- Continued.



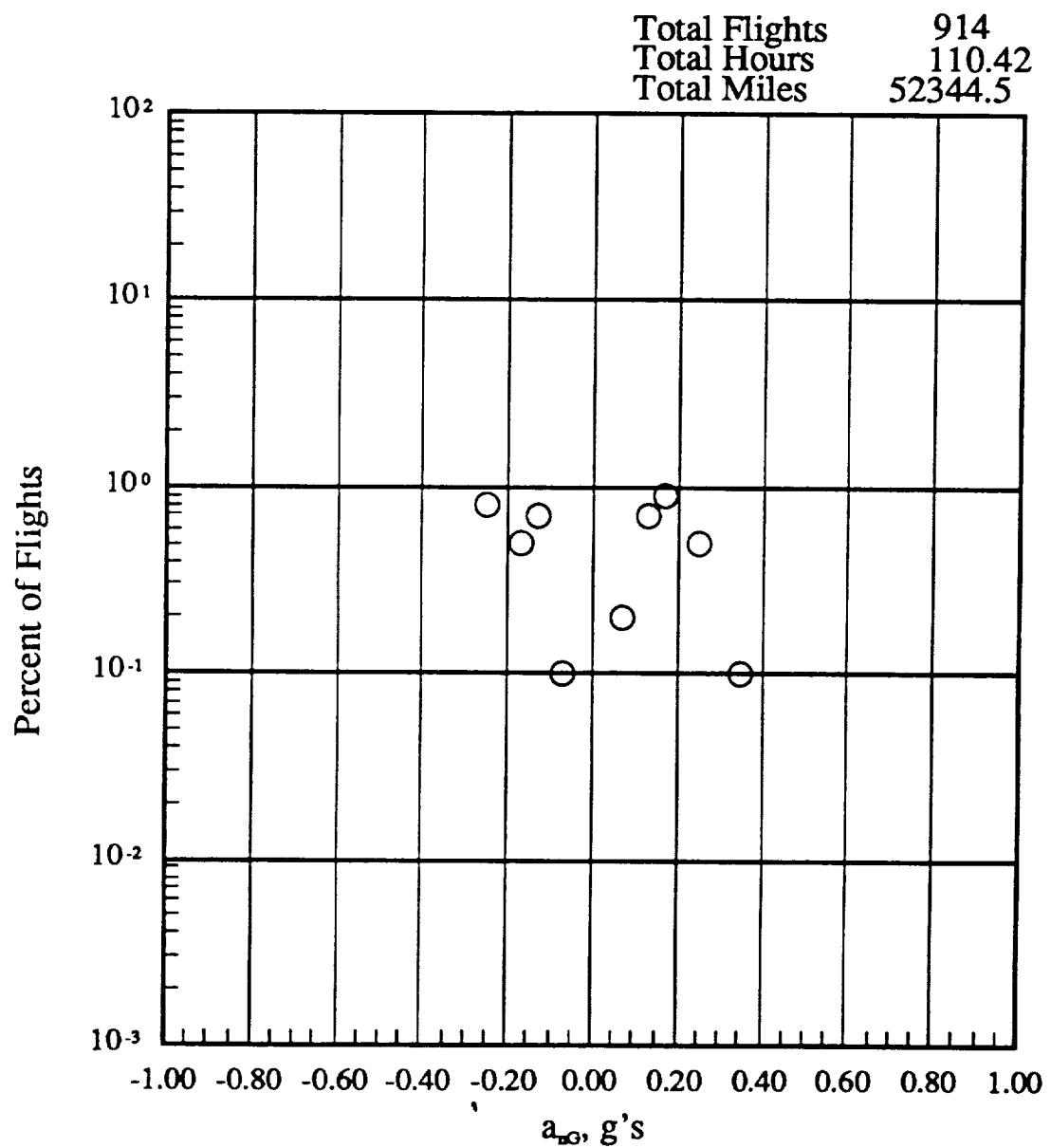
(e) 14500 to 19500 feet altitude

Figure 18.- Continued.



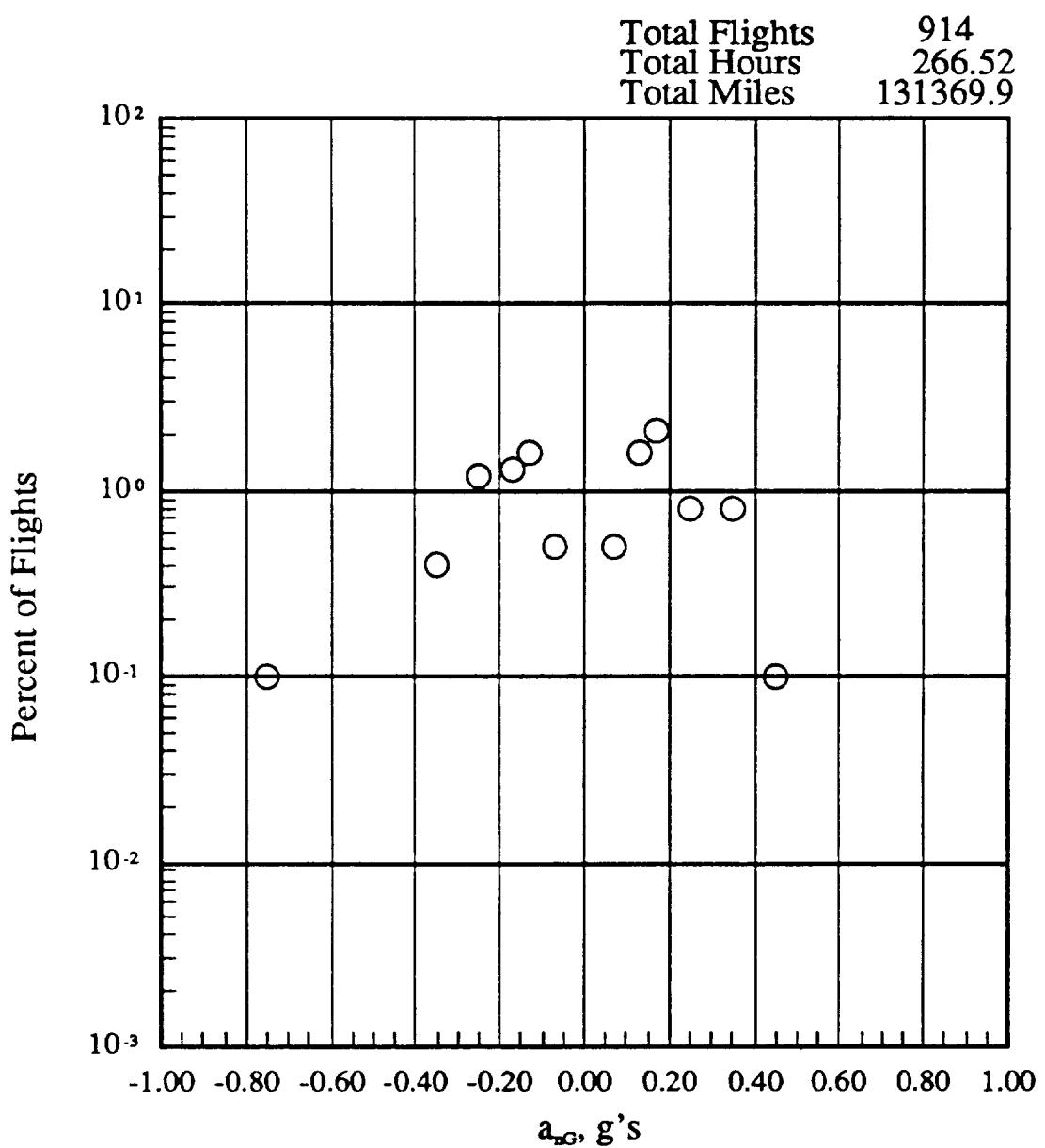
(f) 19500 to 24500 feet altitude

Figure 18.- Continued.



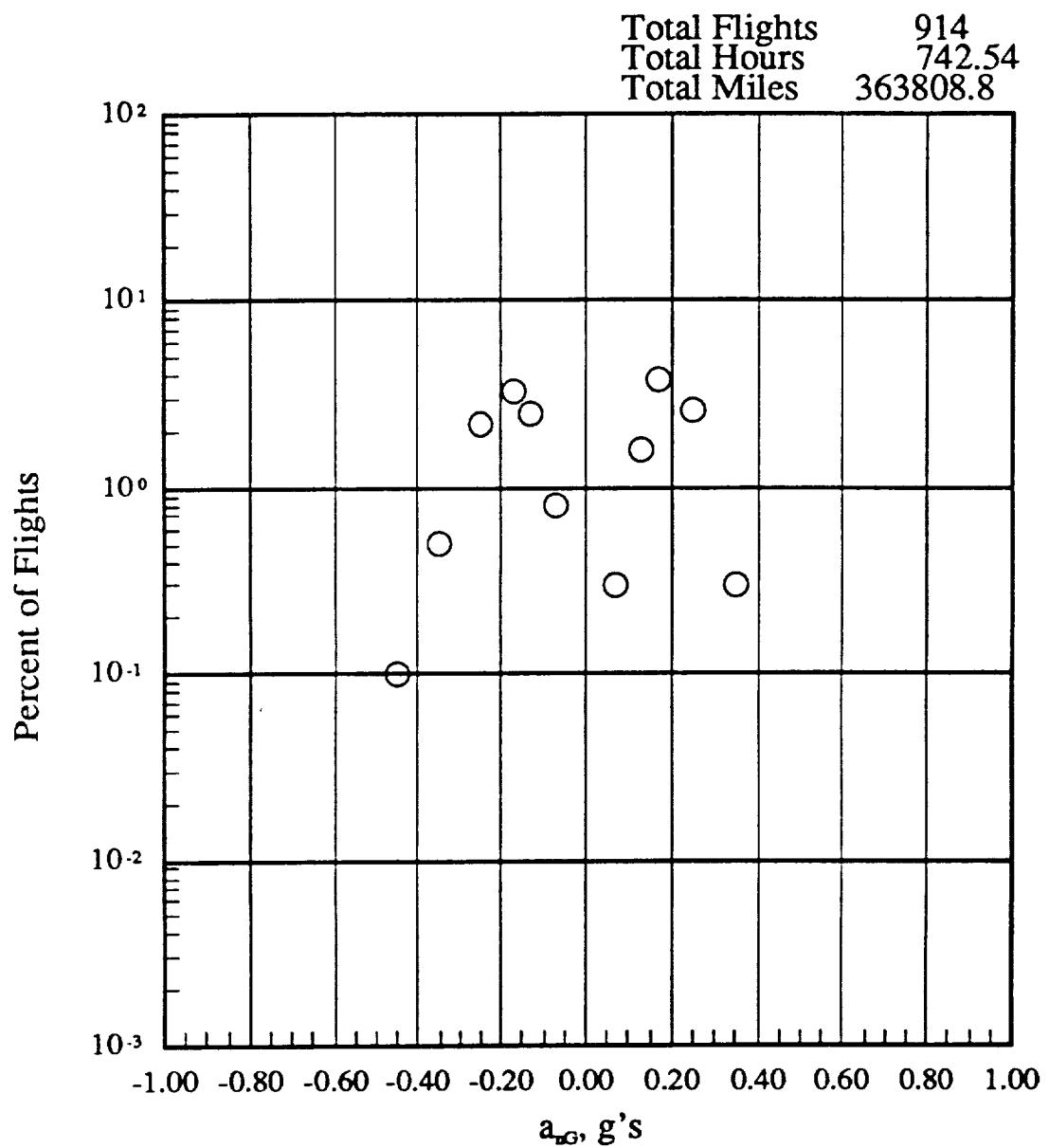
(g) 24500 to 29500 feet altitude

Figure 18.- Continued.



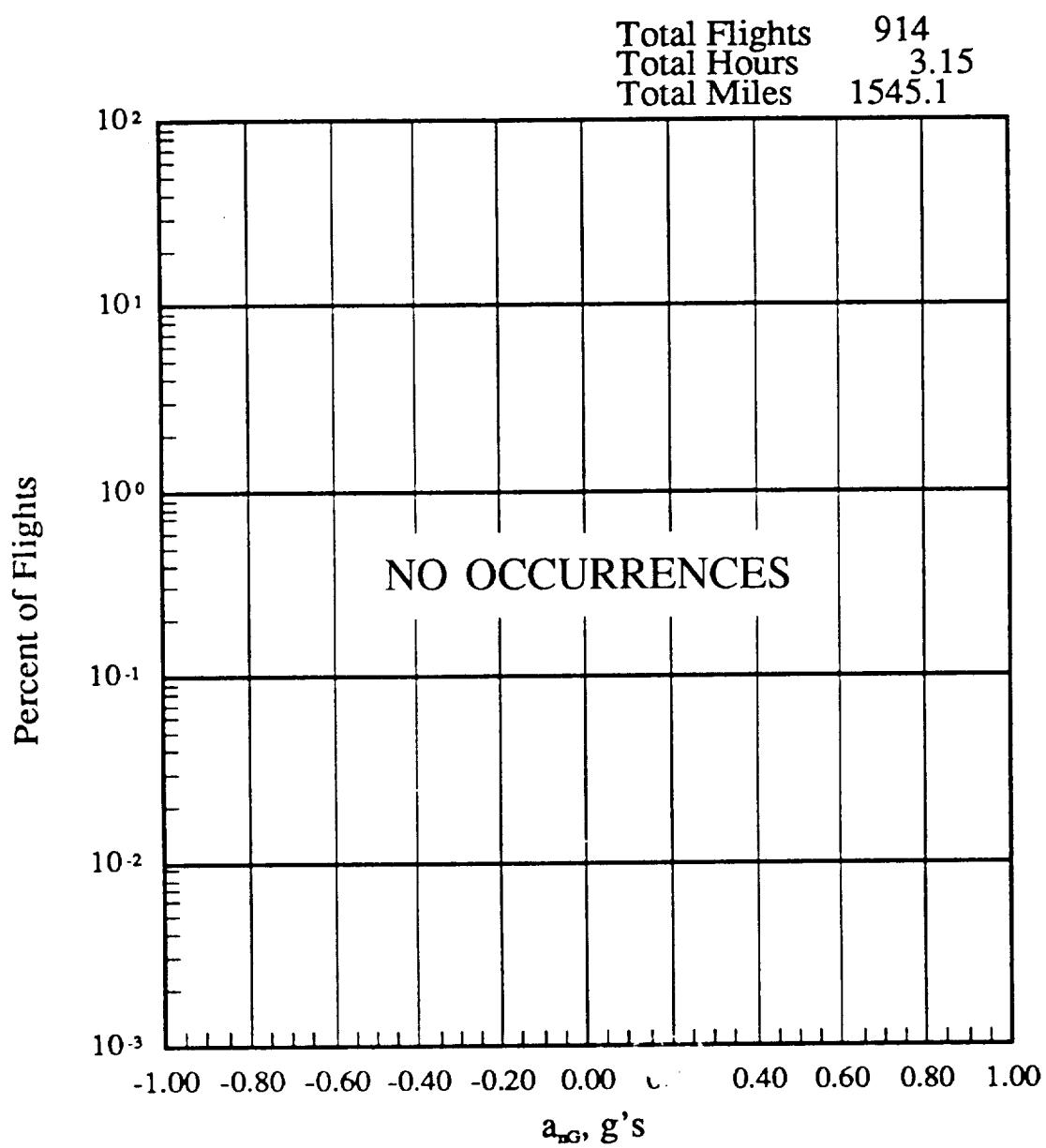
(h) 29500 to 34500 feet altitude

Figure 18.- Continued.



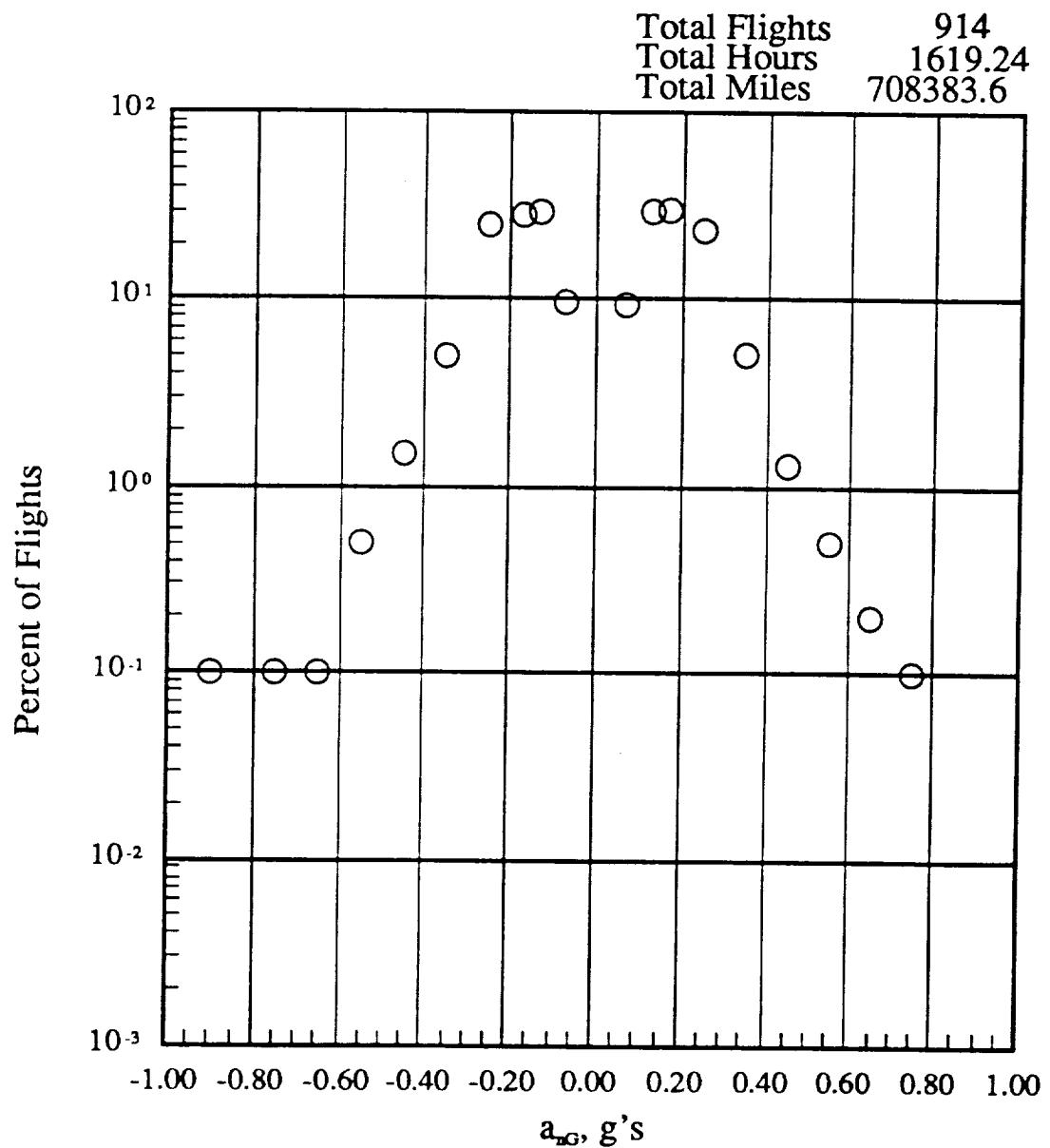
(i) 34500 to 39500 feet altitude

Figure 18.- Continued.



(j) 39500 to 44500 feet altitude

Figure 18.- Continued.

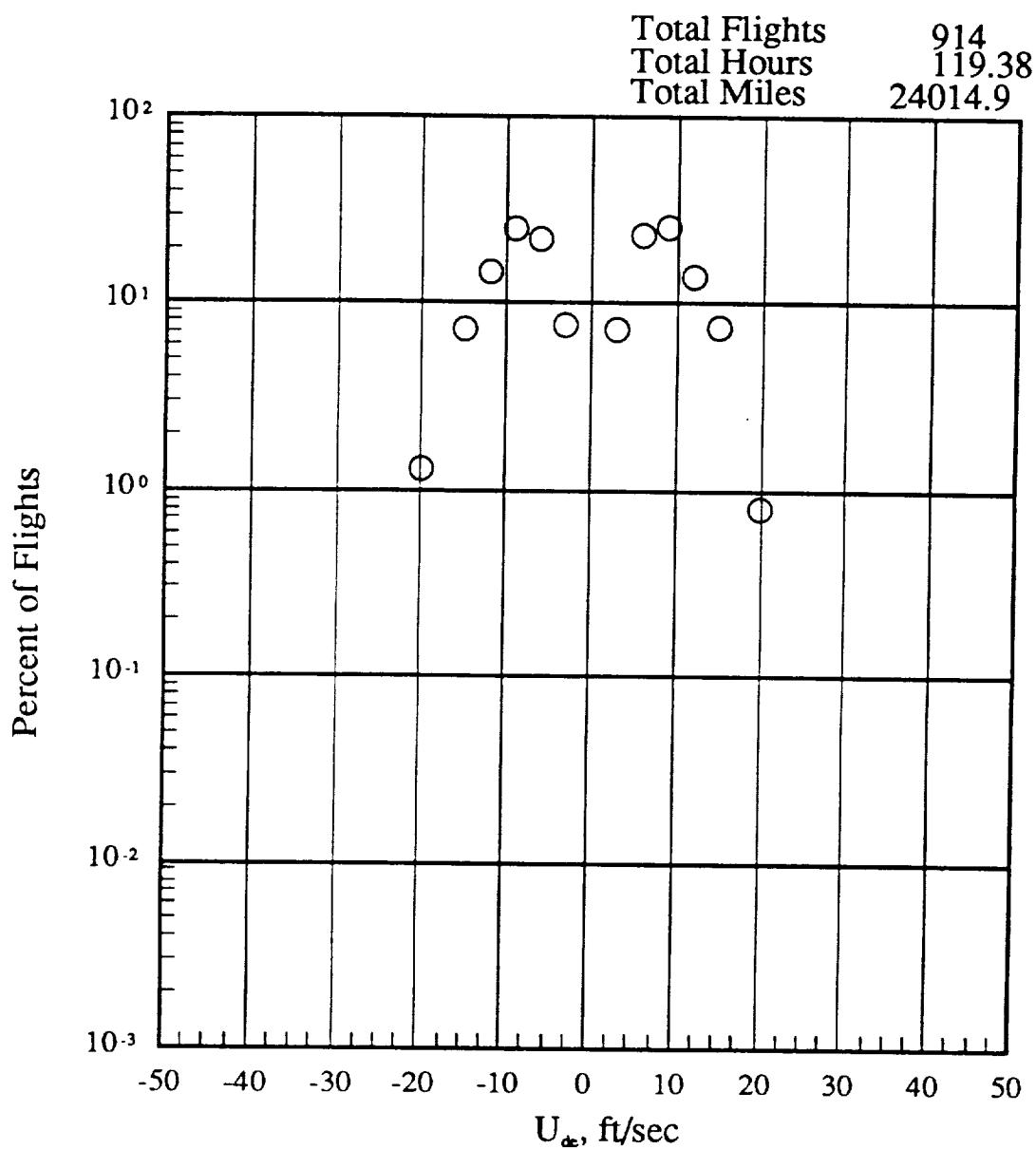


(k) -500 to 44500 feet altitude

Figure 18.- Concluded.

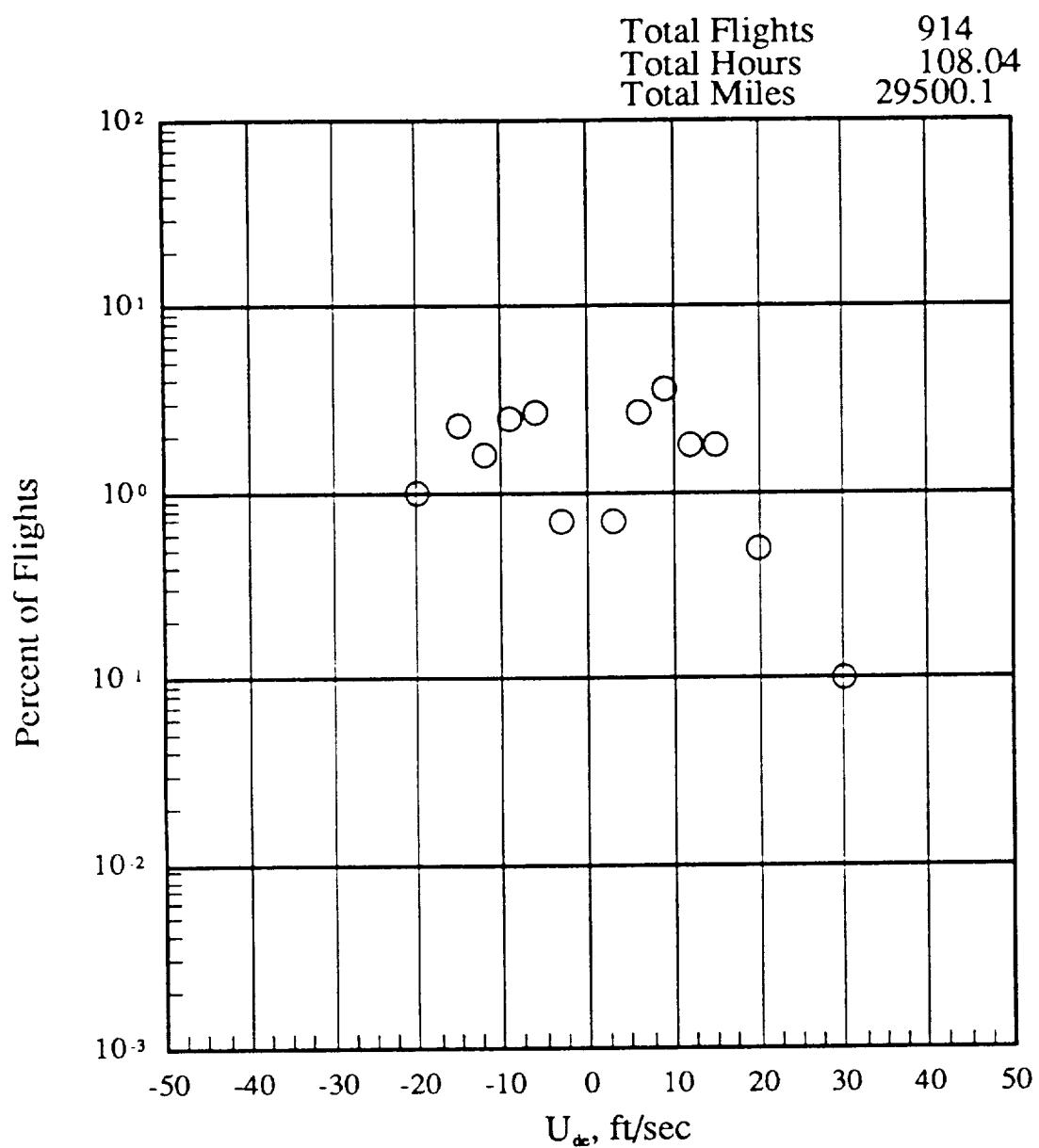
(a) Percent of flights where peak positive and negative  $U_d$  de per flight occurs within pressure altitude bands, any flap

Figure 19.- Peak positive and negative  $U_{de}$  vs altitude.



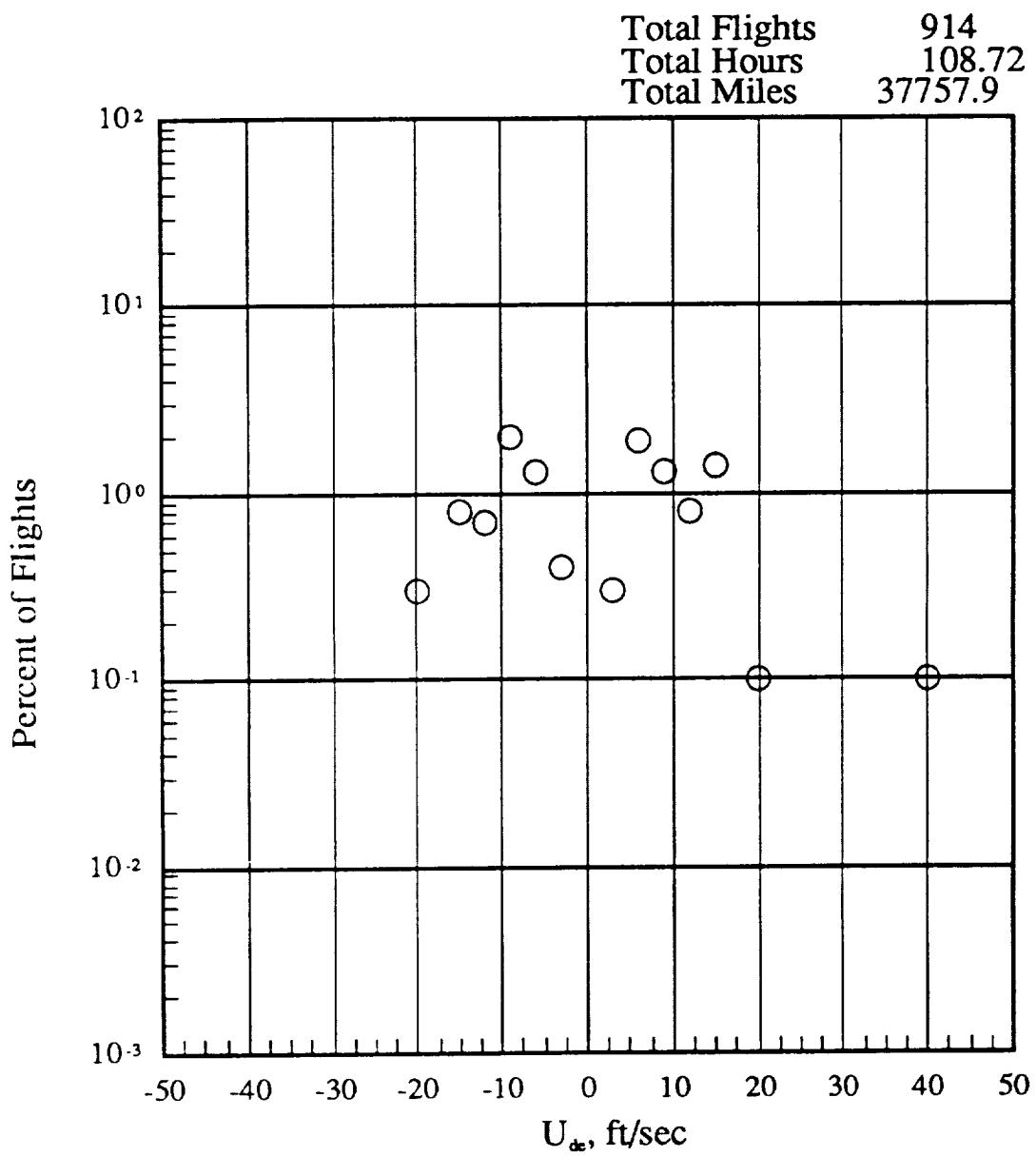
(b) -500 to 4500 feet altitude

Figure 19.- Continued.



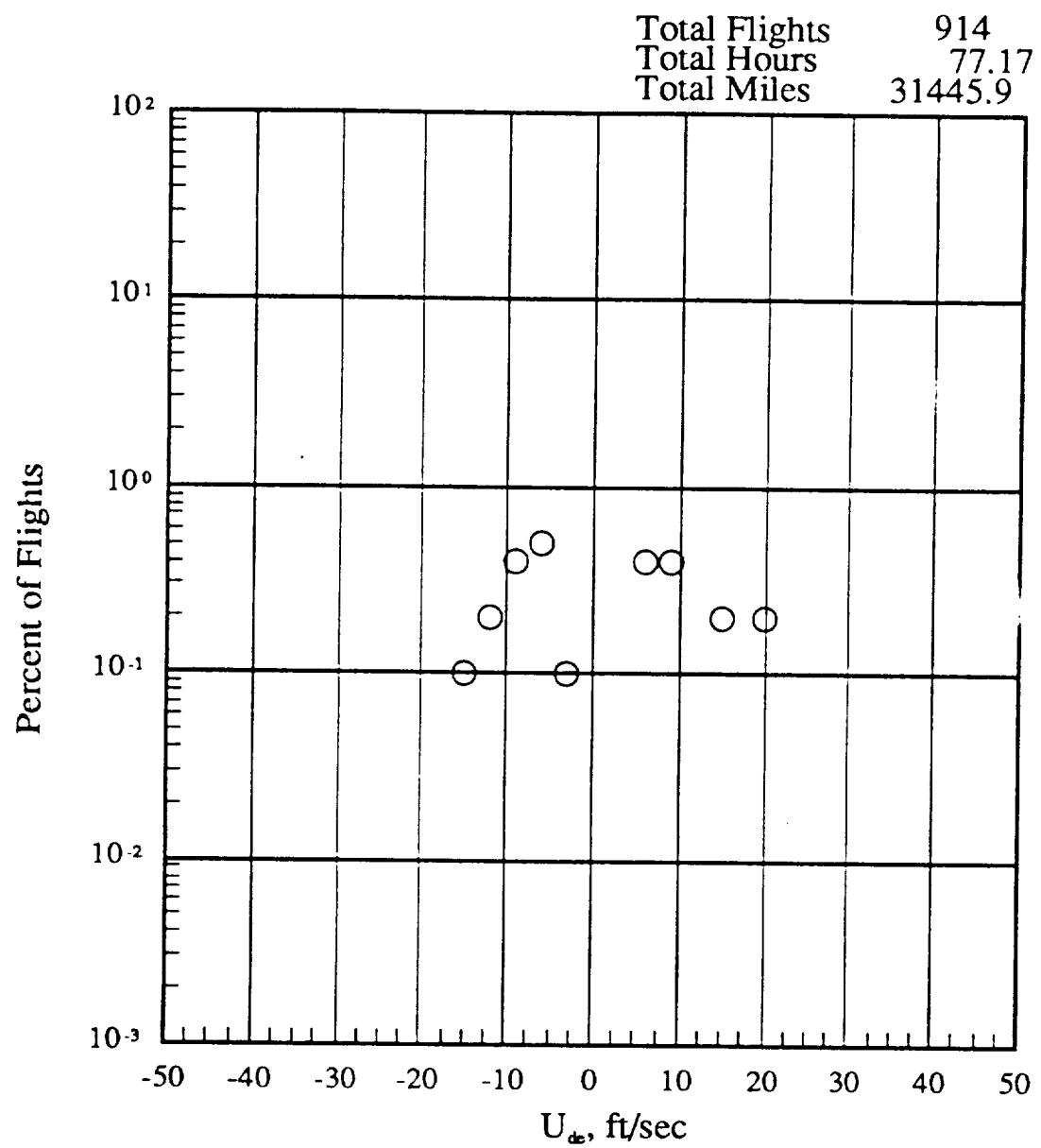
(c) 4500 to 9500 feet altitude

Figure 19.- Continued.



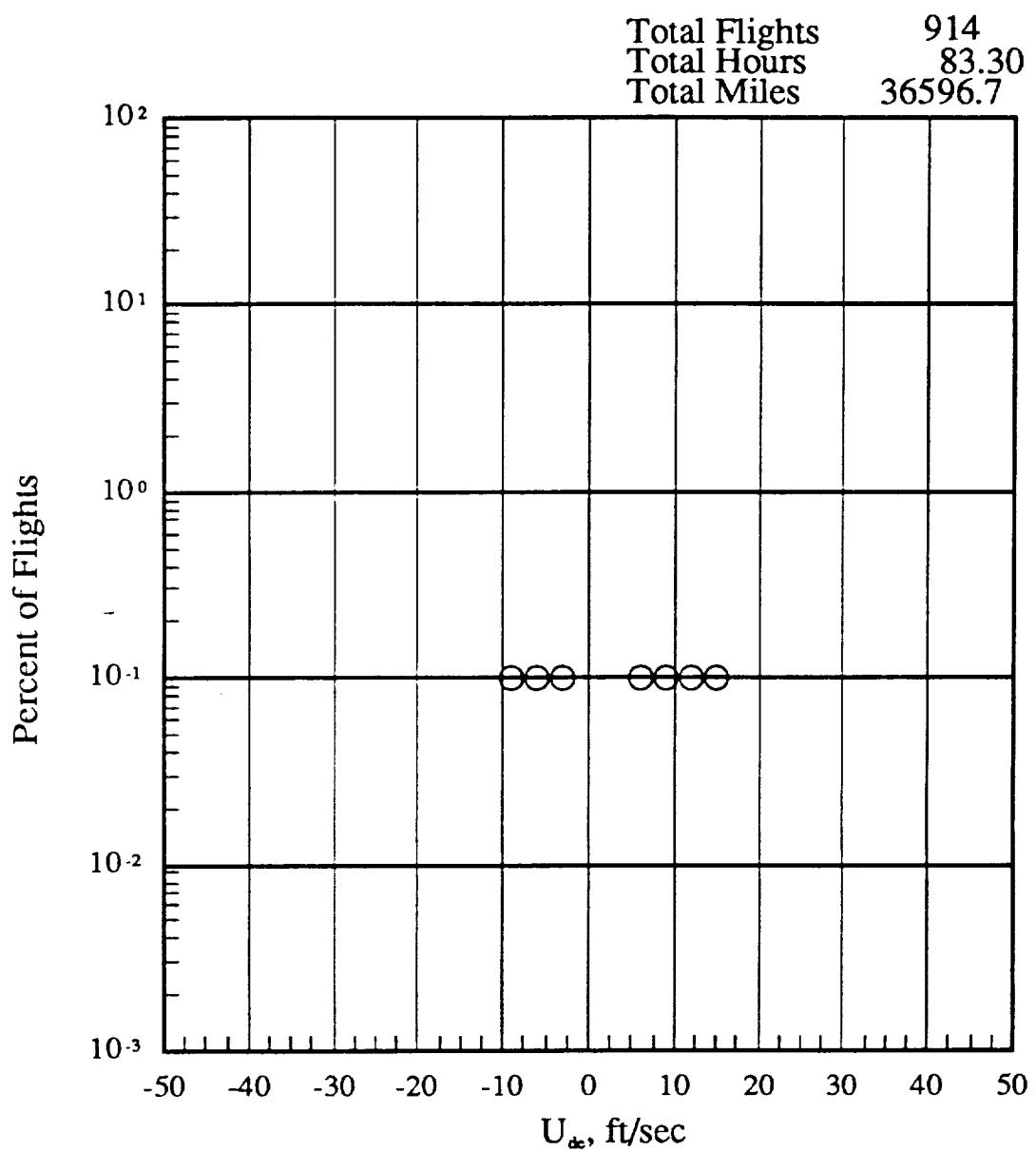
(d) 9500 to 14500 feet altitude

Figure 19.- Continued.



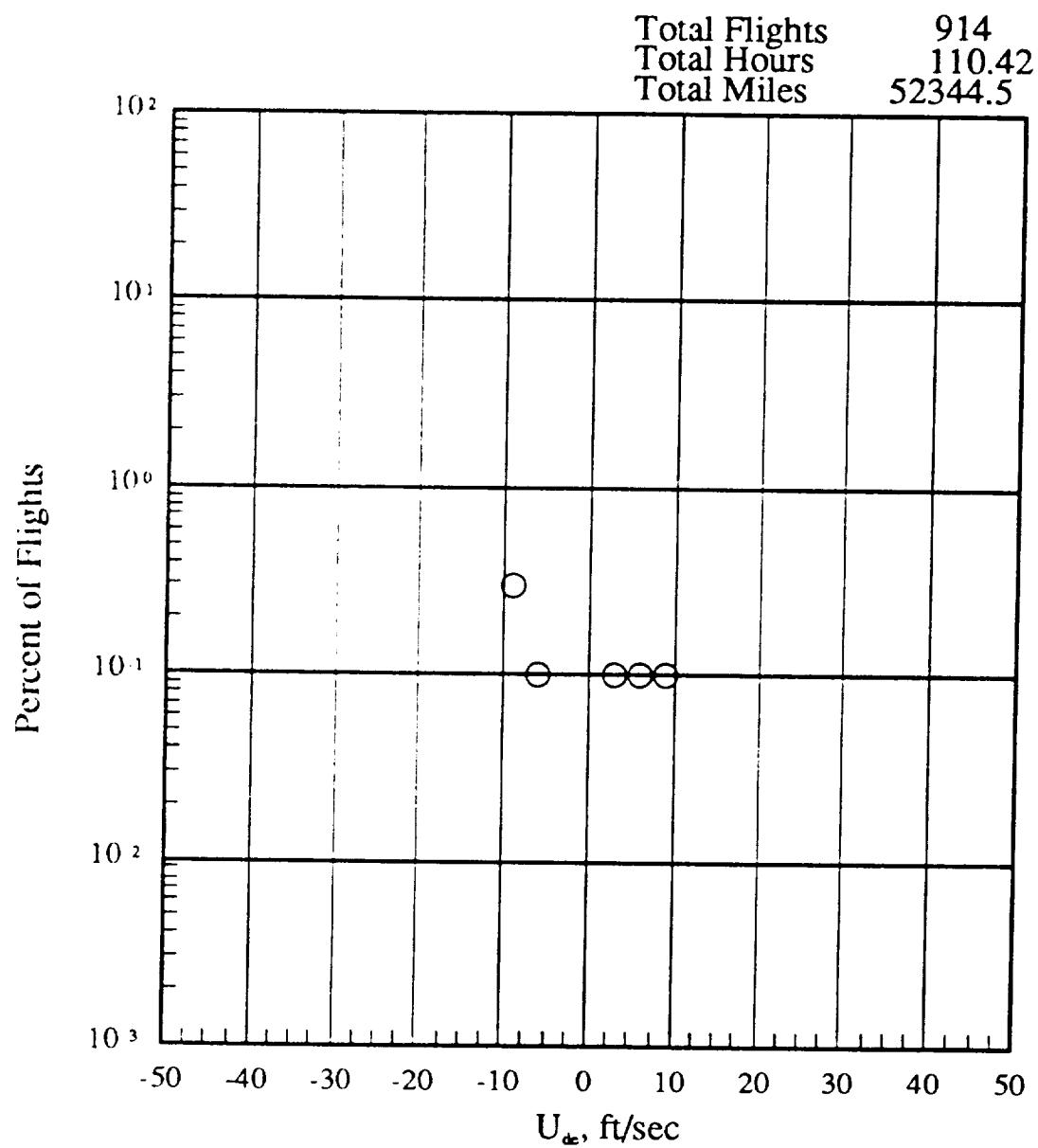
(e) 14500 to 19500 feet altitude

Figure 19.- Continued.



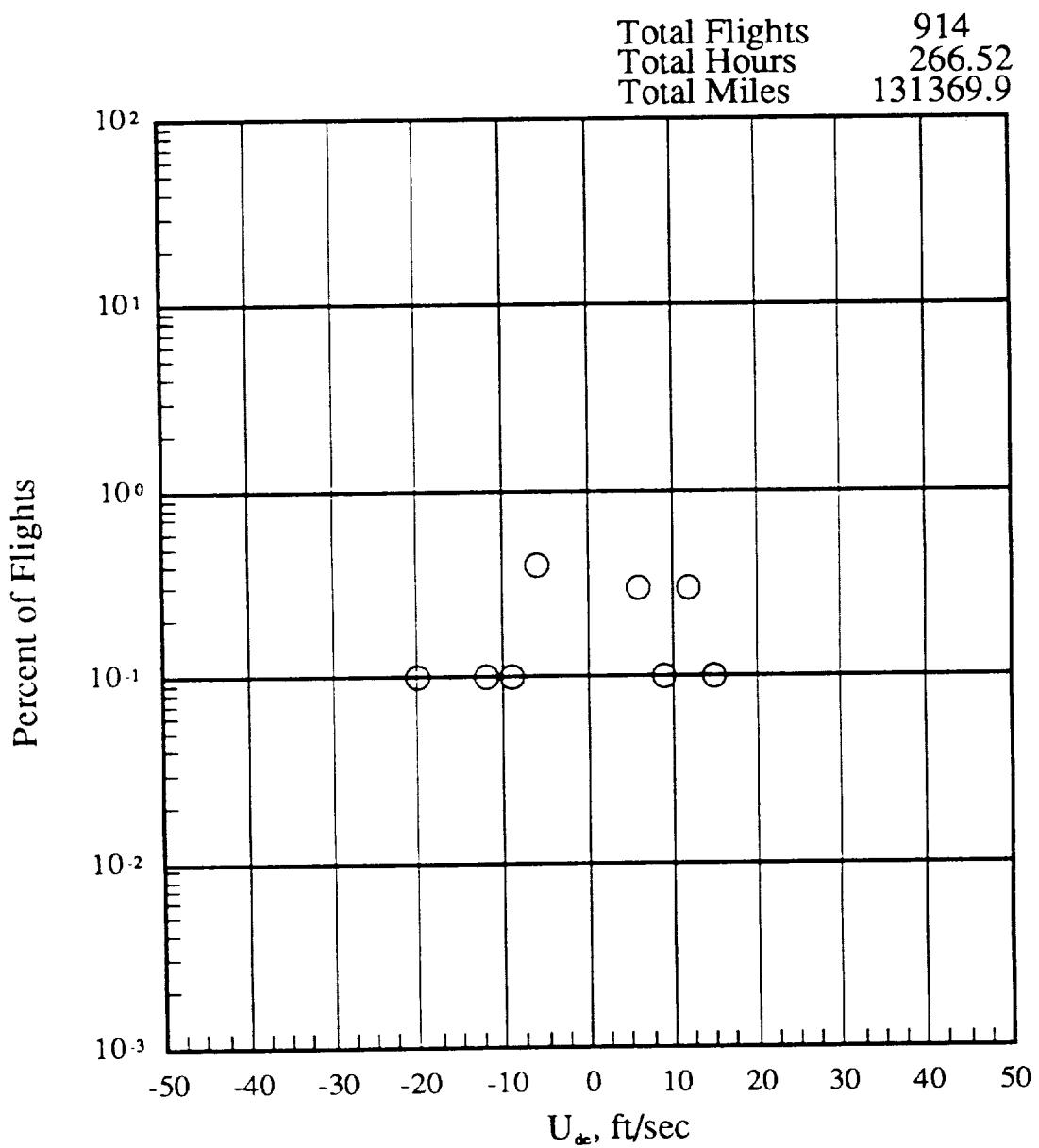
(f) 19500 to 24500 feet altitude

Figure 19.- Continued.



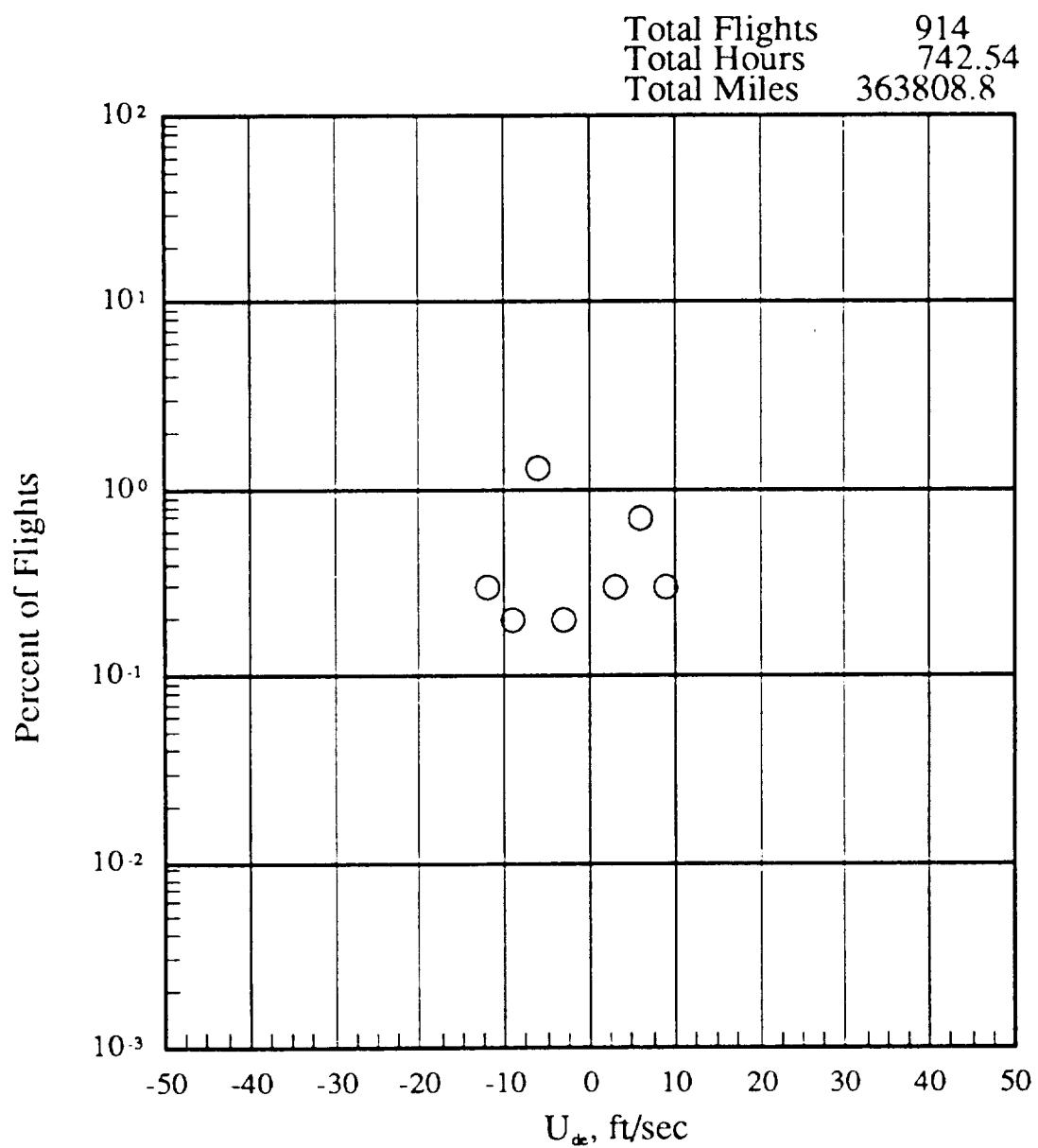
(g) 24500 to 29500 feet altitude

Figure 19.- Continued.



(h) 29500 to 34500 feet altitude

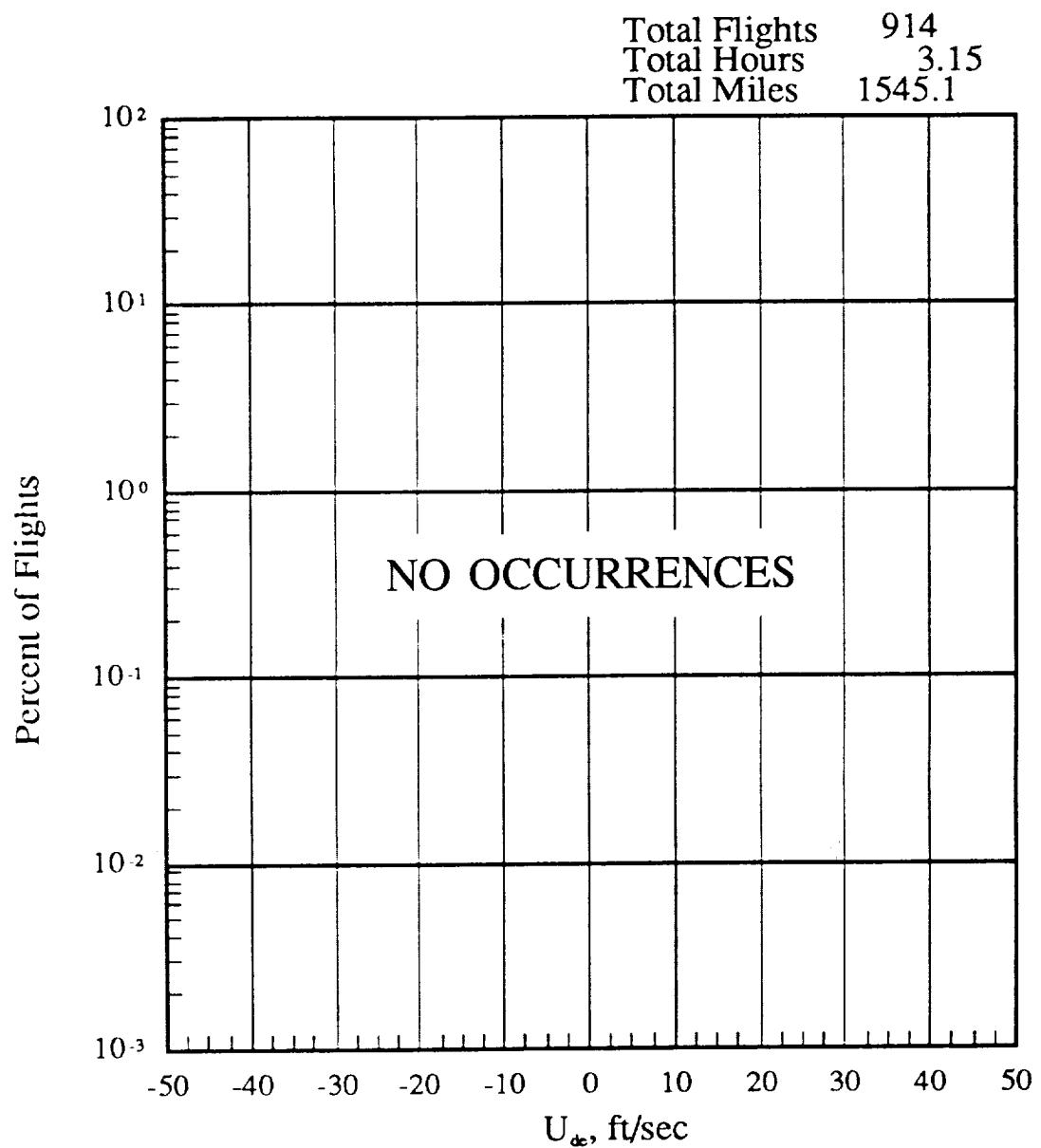
Figure 19.- Continued.



(i) 34500 to 39500 feet altitude

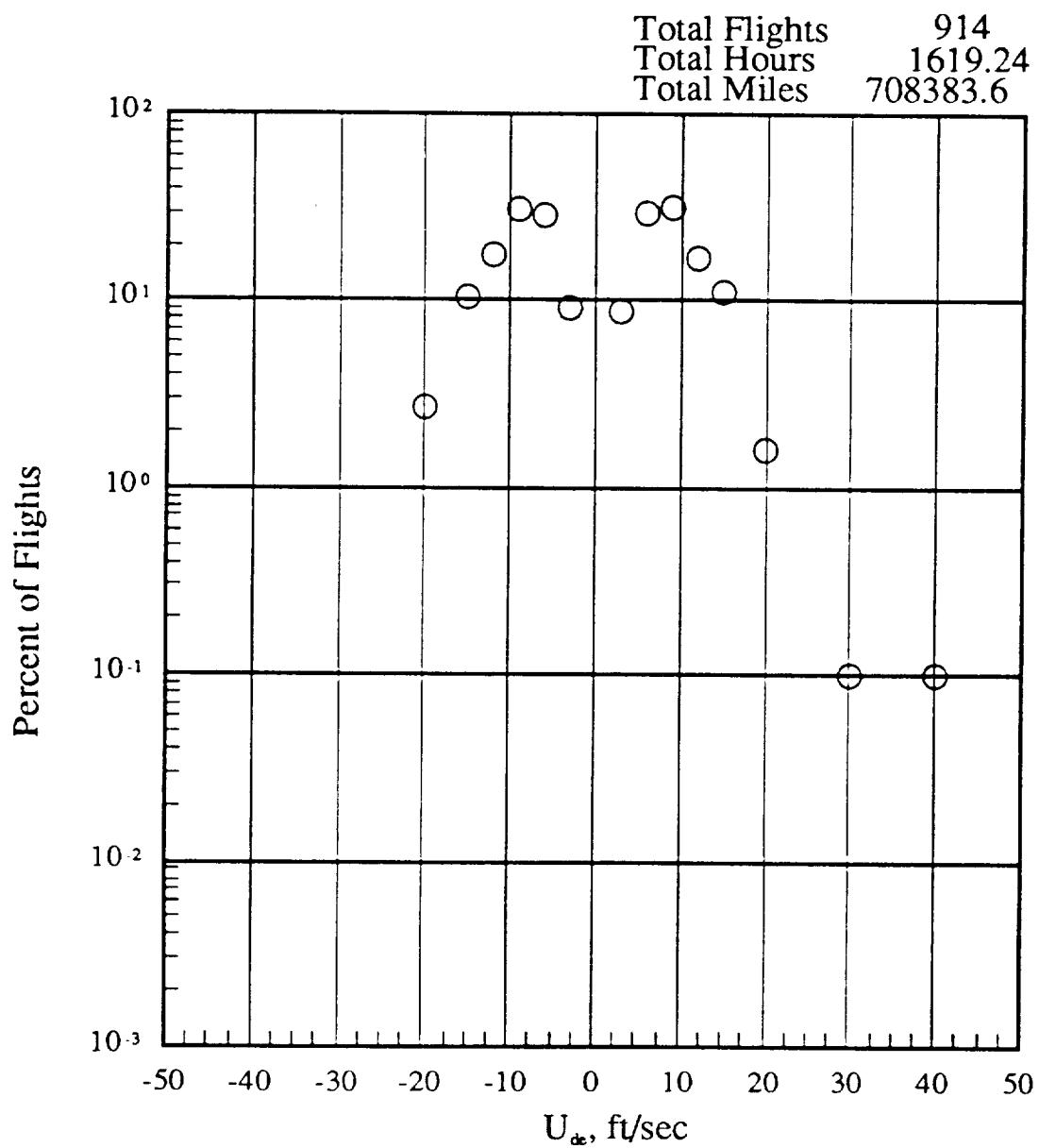
71

Figure 19.- Continued.



(j) 39500 to 44500 feet altitude

Figure 19.- Continued.



(k) -500 to 44500 feet altitude

Figure 19.- Concluded.

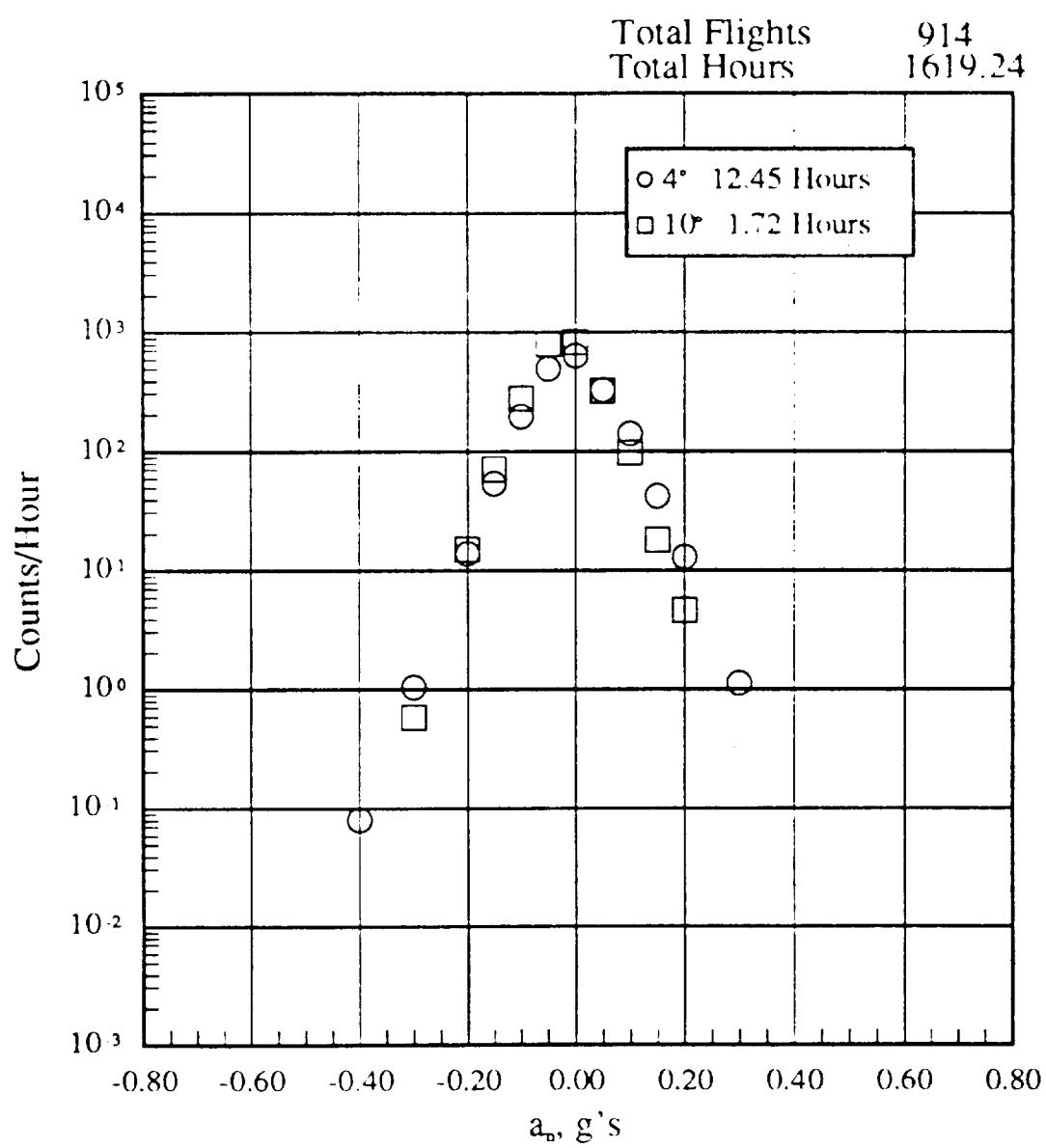
## FLAP DETENT

$a_n$	LEVEL	4	10	18	22	27	33	42
	g's							
1.60	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0
.30	1.124	4.650	0	0	0	0	0	0
.20	13.007	4.650	0	0	0	0	0	0
.15	41.993	18.020	0	0	0	0	0	0
.10	140.754	97.077	0	0	0	0	0	0
.05	327.275	320.878	240.00	0	0	0	0	0
0	634.877	826.029	1080.00	900.000	0	0	0	0
-.05	493.321	801.033	720.00	642.857	0	0	0	0
-.10	196.638	279.025	480.00	257.143	0	0	0	0
-.15	53.555	70.919	0	0	0	0	0	0
-.20	13.891	15.114	0	0	0	0	0	0
-.30	1.044	0.581	0	0	0	0	0	0
-.40	0.080	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0
-.1.00	0	0	0	0	0	0	0	0
-.1.20	0	0	0	0	0	0	0	0
-.1.40	0	0	0	0	0	0	0	0
-.1.60	0	0	0	0	0	0	0	0
FLIGHT HOURS								
IN DETENT		12.454	1.720	0.008	0.008	0	0	0
TOTAL HOURS								
						14.19		
						914		
						1619.24		
						708383.60		

(a) Take off

Figure 20.-  $a_n$  Exceedances with flaps deflected.

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(b) Take off

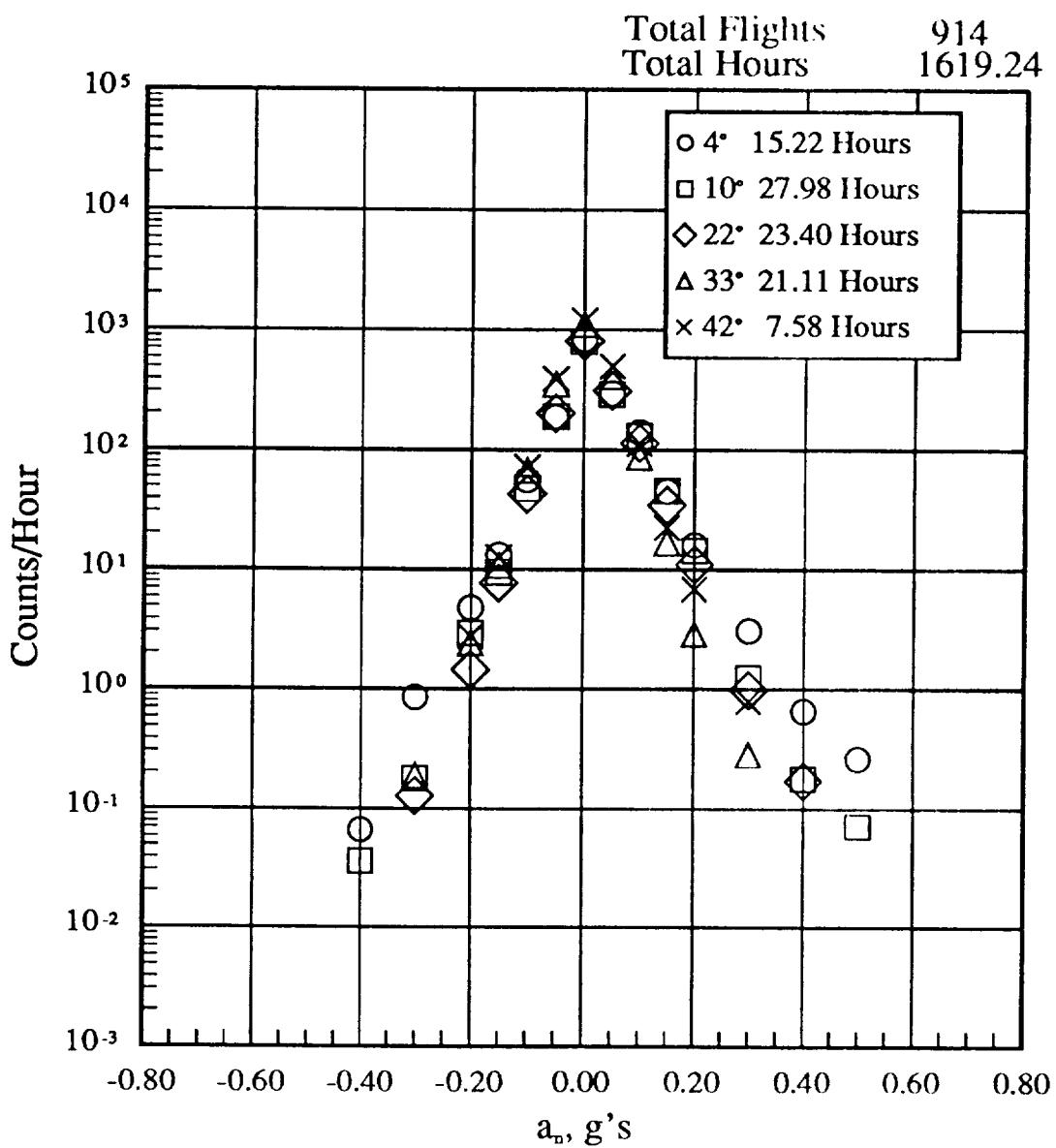
Figure 20.- Continued.

## FLAP DETENT

$a' n$ LEVEL $g's$	4	10	18	22	27	33	42
1.60	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0
.50	0.263	0.071	0	0	0	0	0
.40	0.657	0.179	0	0.171	0	0	0
.30	3.059	1.251	2.048	0.983	0	0.284	0.791
.20	16.034	14.332	15.971	11.028	9.943	2.889	6.856
.15	45.081	45.318	54.055	34.621	37.964	16.768	22.414
.10	140.039	130.522	167.899	113.695	137.393	86.918	112.466
.05	293.418	286.633	395.177	308.942	390.484	403.185	495.483
0	832.478	793.388	731.384	806.848	687.866	1109.944	1197.836
-.05	185.711	188.349	199.431	201.488	361.559	351.508	389.214
-.10	55.958	47.427	49.141	42.700	105.756	66.882	71.593
-.15	13.209	9.507	10.238	7.736	23.501	10.752	12.657
-.20	4.797	2.931	3.276	1.453	2.712	2.416	2.769
-.30	0.854	0.179	0.410	0.128	0	0.189	0
-.40	0.066	0.036	0	0	0	0	0
-.50	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0
-.1.00	0	0	0	0	0	0	0
-.1.20	0	0	0	0	0	0	0
-.1.40	0	0	0	0	0	0	0
-.1.60	0	0	0	0	0	0	0
FLIGHT HOURS IN DETENT		15.217	27.980	2.442	23.396	1.106	21.112
TOTAL HOURS							7.585
TOTAL FLIGHTS							98.84
TOTAL FLIGHT HOURS FLAPS UP A							914
TOTAL FLIGHT HOURS FLAPS UP AND DOWN							1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN							70393.60

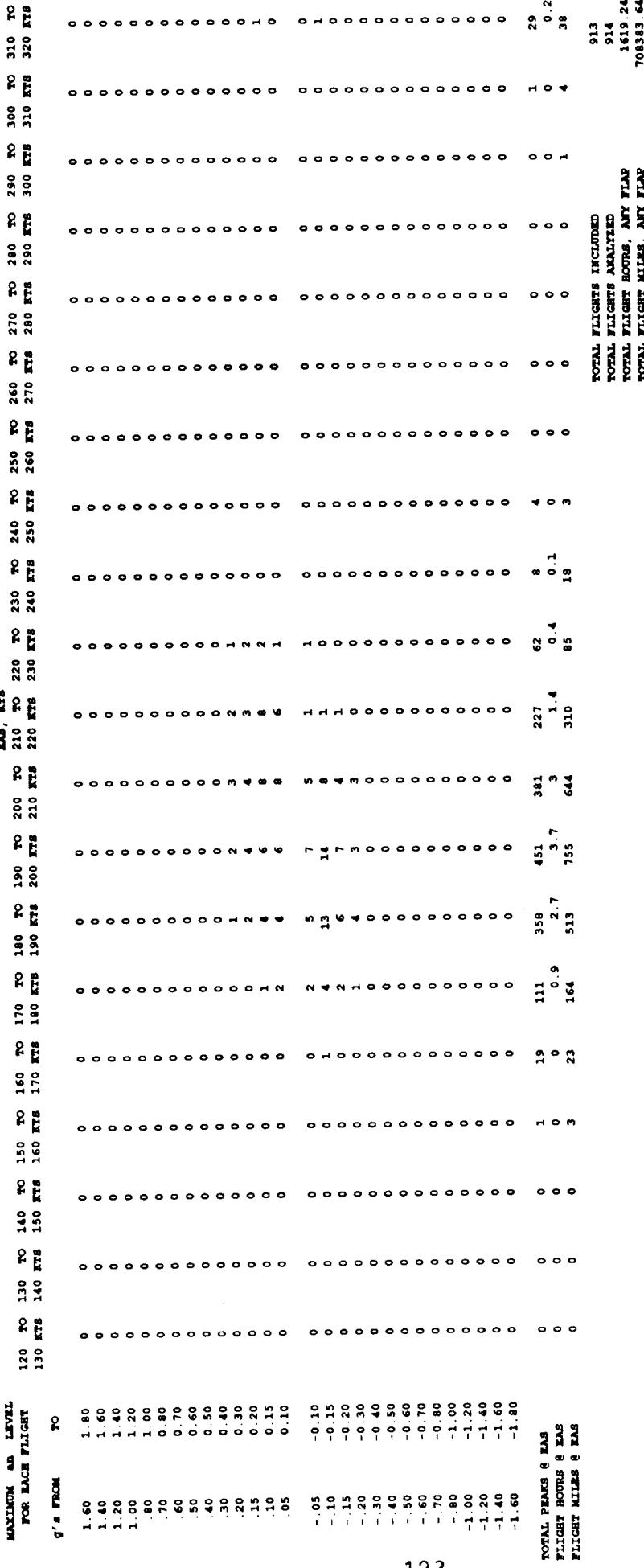
(c) Landing

Figure 20.- Continued.



(d) Landing.

Figure 20.- Concluded.

Figure 21.- Percent of flights with peak positive and negative  $a_n$  per flight vs. EAS bands.

(a) Take off; flaps 4 degree detent

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(b) Take off; flap 10 degree deflection

Figure 21:- Continued.

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(c) Take off; flap 18 degree detent

Figure 21.- Continued.

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2.50  
4  
3.24  
708383.64

TOTAL FLIGHTS INCLUDED  
TOTAL FLIGHTS ANALYZED  
TOTAL FLIGHT HOURS, ANY PLANE

(d) Take off; flap 22 degree deflection

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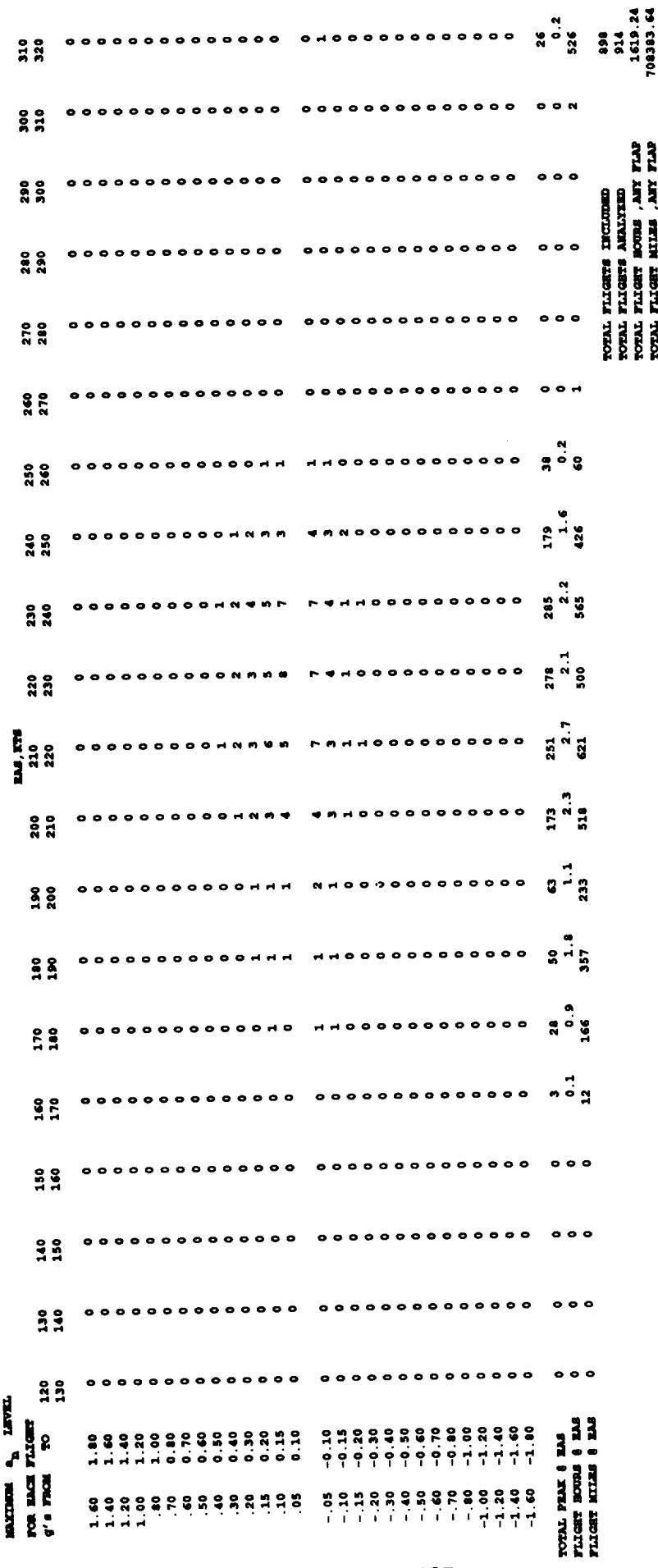


Figure 21.- Continued.

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MANUFACTURE	LEVEL	EAS, FT/S										EAS, FT/S										EAS, FT/S									
		120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320									
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.15	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.10	0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.05	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.05	-.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.10	-.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.15	-.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.20	-.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.30	-.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.40	-.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.50	-.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.60	-.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.70	-.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.80	-.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.90	-.100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.100	-.120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.120	-.140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.140	-.160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.160	-.180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
18	104	203	223	233	256	267	21	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4.0	3.1	5.7	5.0	3.4	4.1	4.0	1.8	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
60	551	1059	965	701	902	932	425	42	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
TOTAL FLIGHTS & EAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
FLIGHT HOURS & EAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
FLIGHT MILES & EAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

TOTAL FLIGHTS INCLUDED  
TOTAL FLIGHTS ABANDONED  
TOTAL FLIGHT HOURS , ANY FLAP  
TOTAL FLIGHT MILES , ANY FLAP

909.50  
914  
1619.24  
708383.64

Fig. 21.-Continued.

(f) Landing; flaps 10 degree defent

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(g) Landing; flaps 18 degree detent

Figure 21.- Continued.

MANEUVER	$\alpha_0$	LEVEL	FOR EACH FLIGHT	g's FROM	TO	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320
	1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.15	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.10	0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.05	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.05	-.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.10	-.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.15	-.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.20	-.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.30	-.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.40	-.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.50	-.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.60	-.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.70	-.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.80	-.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-.90	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL FLIGHTS & MILES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS & MILES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT MILES & HOURS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

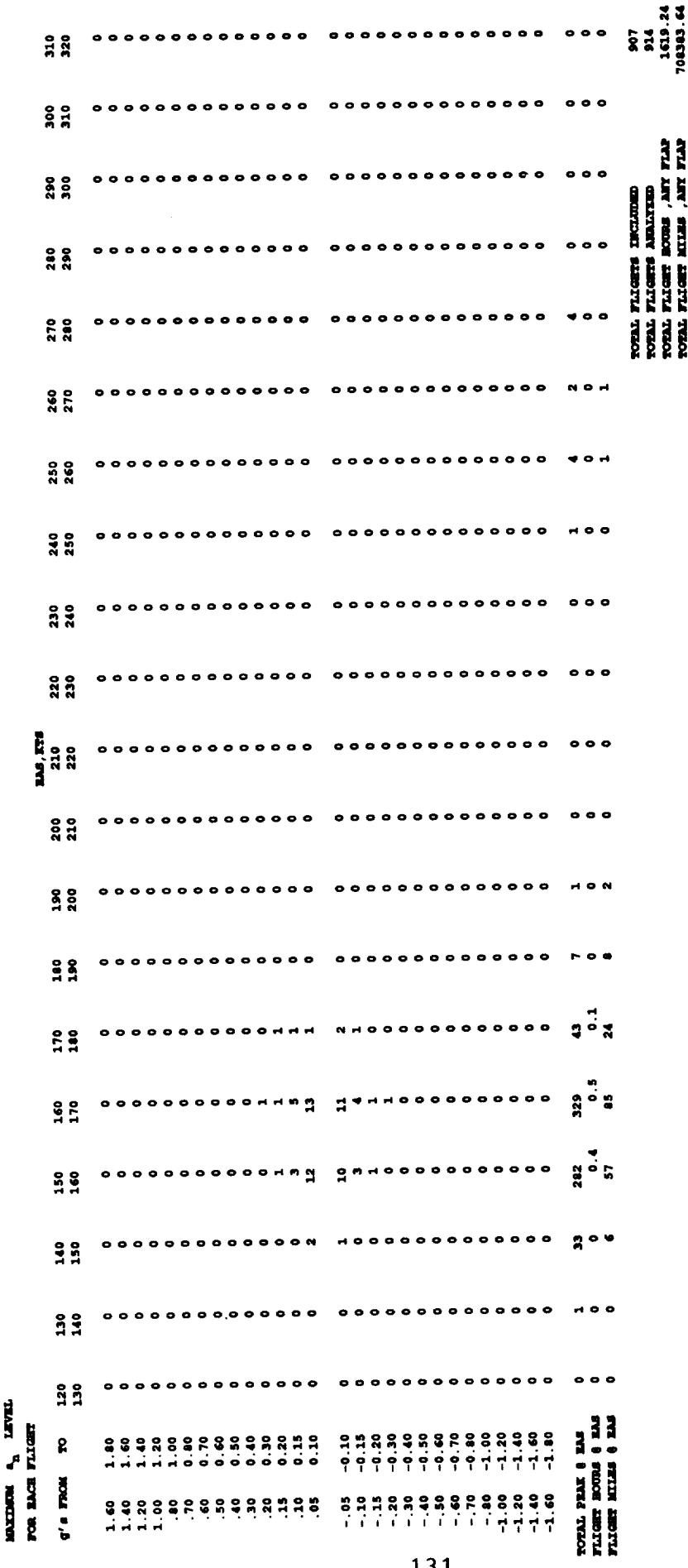
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(h) Landing; flaps 22 degree detent

Figure 21.- Continued.

TOTAL FLIGHTS INCLUDED 913  
TOTAL FLIGHTS ANALYZED 914  
TOTAL FLIGHTS, ANY FLAP 1615.24  
TOTAL FLIGHTS, ANY FLAP 703383.64

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(i) Landing; flaps 27 degree detent

Figure 21.- Continued.

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MAXIMUM $\frac{V_2}{V_1}$ LEVEL FOR EACH FLIGHT $g' = 3000$	EAS, KTS										TOTAL FLIGHTS INCLUDED TOTAL FLIGHTS ANALYZED TOTAL FLIGHTS 'ANY FLAP' TOTAL FLIGHTS 'NO FLAP'
	120	130	140	150	160	170	180	190	200	210	
1.60	1.80	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0
.70	.80	0	0	0	0	0	0	0	0	0	0
.60	.70	0	0	0	0	0	0	0	0	0	0
.50	.60	0	0	0	0	0	0	0	0	0	0
.40	.50	0	0	0	0	0	0	0	0	0	0
.30	.40	0	0	0	0	0	0	0	0	0	0
.20	.30	0	0	0	0	1	3	0	0	0	0
.15	.20	0	1	7	8	1	0	0	0	0	0
.10	.15	0	2	13	12	2	0	0	0	0	0
.05	.10	0	2	13	14	4	0	0	0	0	0
-.05	-.10	0	3	16	15	4	0	0	0	0	0
-.10	-.15	0	3	12	13	2	0	0	0	0	0
-.15	-.20	0	1	4	4	1	0	0	0	0	0
-.20	-.30	0	0	1	2	0	0	0	0	0	0
-.30	-.40	0	0	0	0	0	0	0	0	0	0
-.40	-.50	0	0	0	0	0	0	0	0	0	0
-.50	-.60	0	0	0	0	0	0	0	0	0	0
-.60	-.70	0	0	0	0	0	0	0	0	0	0
-.70	-.80	0	0	0	0	0	0	0	0	0	0
-.80	-.90	0	0	0	0	0	0	0	0	0	0
-.90	-.100	0	0	0	0	0	0	0	0	0	0
-.100	-.120	0	0	0	0	0	0	0	0	0	0
-.120	-.140	0	0	0	0	0	0	0	0	0	0
-.140	-.160	0	0	0	0	0	0	0	0	0	0
-.160	-.180	0	0	0	0	0	0	0	0	0	0
TOTAL PEAK E EAS	2	116	625	645	141	0	1	10	7	3	0
FLIGHT HOURS E EAS	0.1	2	10	7.8	0.9	0	0	0.1	0	0	0
FLIGHT MILES E EAS	18	284	1486	1217	150	0	4	13	15	2	0

(j) Landing: flaps 33 degree detent

Figure 21.- Continued.

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TOTAL FLIGHTS INCLUDED	309
TOTAL FLIGHTS ANALYZED	914
TOTAL FLIGHT SECONDS , ANY FLAP	1619.24
TOTAL FLIGHT MILES , ANY FLAP	7083.64

(k) Landing; flaps 42 degree detent

Figure 21.- Concluded.

		PRESSURE ALTITUDE BANDS									
$a_n$	LEVEL	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
g's											
1.60	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0
.50	0.11	0	0	0	0	0	0	0	0	0	0.04
.40	0.77	0	0.45	0.52	0	0	0	0	0	0	0.38
.30	2.21	1.92	1.79	1.03	2.50	0	0	0	0	0	1.48
.20	22.76	9.59	11.16	2.58	9.59	0	4.73	0	0	0	11.89
.15	57.00	20.56	27.23	5.16	27.48	0	9.45	1.38	0	0	29.27
.10	159.96	74.29	84.38	25.27	51.21	13.42	33.09	15.85	0	0	87.69
.05	335.94	130.22	226.36	95.92	146.15	148.56	115.01	101.68	12.42	0	205.29
0.00	752.41	1248.16	888.03	1006.10	954.34	1095.53	951.60	1489.98	696.26	976.33	0
-.05	272.09	111.85	144.66	81.48	178.63	98.72	143.37	117.19	14.49	170.87	0
-.10	88.93	33.72	45.09	17.02	27.48	5.75	17.33	14.13	0	0	48.17
-.15	25.08	8.50	12.50	2.58	2.50	0	3.15	1.72	0	0	12.65
-.20	6.63	3.56	5.36	1.55	1.25	0	1.58	0.34	0	0	3.84
-.30	0.33	0.27	1.34	0.52	0	0	1.58	0	0	0	0.38
-.40	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0
-.1.00	0	0	0	0	0	0	0	0	0	0	0
-.1.20	0	0	0	0	0	0	0	0	0	0	0
-.1.40	0	0	0	0	0	0	0	0	0	0	0
-.1.60	0	0	0	0	0	0	0	0	0	0	0
		TOTAL FLIGHTS									
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71	
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26	
		TOTAL FLIGHT HOURS FLAPS UP AND DOWN									
		TOTAL FLIGHT MILES FLAPS UP AND DOWN									
		56									

(a)  $a_n$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Normal acceleration exceedances: Non-revenue flights.

PRESSURE ALTITUDE BANDS

$a_{nM}$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
<b>g's</b>										
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.30	0.22	0	0	0	1.25	0	0	0	0	0.13
.20	2.32	0.55	0.89	0	2.50	0	0	0	0	1.14
.15	8.62	2.47	3.57	0	5.00	0	0	0	0	4.18
.10	26.84	15.63	12.50	3.61	11.24	0	0	1.03	0	14.64
.05	58.88	35.91	41.52	21.14	23.73	1.8.21	23.63	7.58	4.14	37.08
0.00	171.01	149.68	134.39	124.80	123.66	145.69	135.49	199.90	208.40	162.64
-.05	36.79	22.48	25.90	21.66	28.73	11.50	15.75	8.27	1.38	24.72
-.10	6.85	4.66	5.80	2.58	3.75	0	0	0.34	0	4.26
-.15	0.99	0.82	0.89	0.52	0	0	0	0	0	0.63
-.20	0.11	0.55	0	0	0	0	0	0	0	0.13
-.30	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0
-.100	0	0	0	0	0	0	0	0	0	0
-.120	0	0	0	0	0	0	0	0	0	0
-.140	0	0	0	0	0	0	0	0	0	0
-.160	0	0	0	0	0	0	0	0	0	0
<b>FLIGHT HOURS @ ALT</b>										
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26
<b>TOTAL FLIGHTS</b>										
TOTAL FLIGHT HOURS										56
FLAPS UP AND DOWN										23.71
TOTAL FLIGHT MILES										7616.26
FLAPS UP AND DOWN										

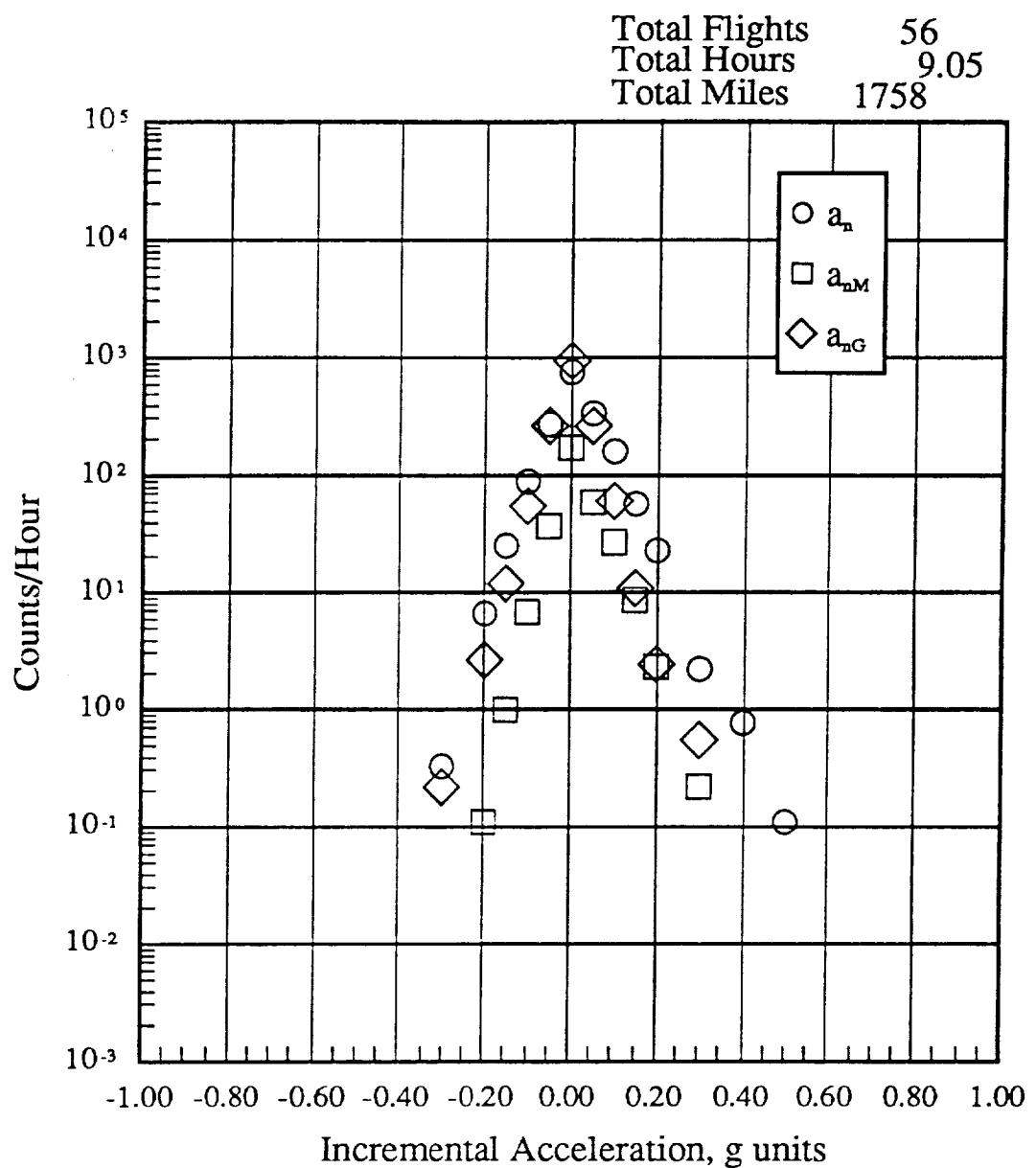
(b)  $a_{nM}$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Continued.

		PRESSURE ALTITUDE BANDS																	
		-500 TO 4500 FT		4500 TO 9500 FT		9500 TO 14500 FT		14500 TO 19500 FT		19500 TO 24500 FT		24500 TO 29500 FT		29500 TO 34500 FT		34500 TO 39500 FT		39500 TO 44500 FT	
$a_{nG}$	LEVEL	g's																	
1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.55	0	0.89	0.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.34
.20	2.43	3.02	3.13	0.52	0	0	0	0	0	0	0	3.15	0	0	0	0	0	1.81	
.15	10.83	4.11	7.59	1.03	1.25	0	0	4.73	1.03	0	0	5.86	0	0	0	0	0	28.64	
.10	60.32	13.16	18.75	5.16	9.99	2.88	14.18	4.48	0	0	0	134.22	0	0	0	0	0	1200.90	
.05	262.92	69.31	99.56	29.39	68.70	23.00	40.96	55.84	0	0	0	1419.44	0	0	0	0	0	1200.90	
0.00	938.44	1256.66	1288.96	1466.61	1366.55	1478.91	1350.20	1416.56	0	0	0	0	0	0	0	0	0	0	0
-.05	263.47	67.44	100.01	28.36	81.19	24.92	39.39	53.77	0.69	0	0	134.26	0	0	0	0	0	0	0
-.10	54.57	13.98	28.13	3.61	8.74	2.88	9.45	5.17	0	0	0	27.25	0	0	0	0	0	0	0
-.15	11.93	6.93	8.93	1.93	1.25	0	4.73	0.34	0	0	0	6.62	0	0	0	0	0	0	0
-.20	2.65	1.10	2.68	0.52	0	0	0	0	0	0	0	1.48	0	0	0	0	0	0	0
-.30	0.22	0	0.89	0.52	0	0	0	0	0	0	0	0.21	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT		9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	2.71								
FLIGHT MILES @ ALT		1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26								
TOTAL FLIGHTS												56							
TOTAL FLIGHT HOURS												23.71							
TOTAL FLIGHT MILES												7616.26							

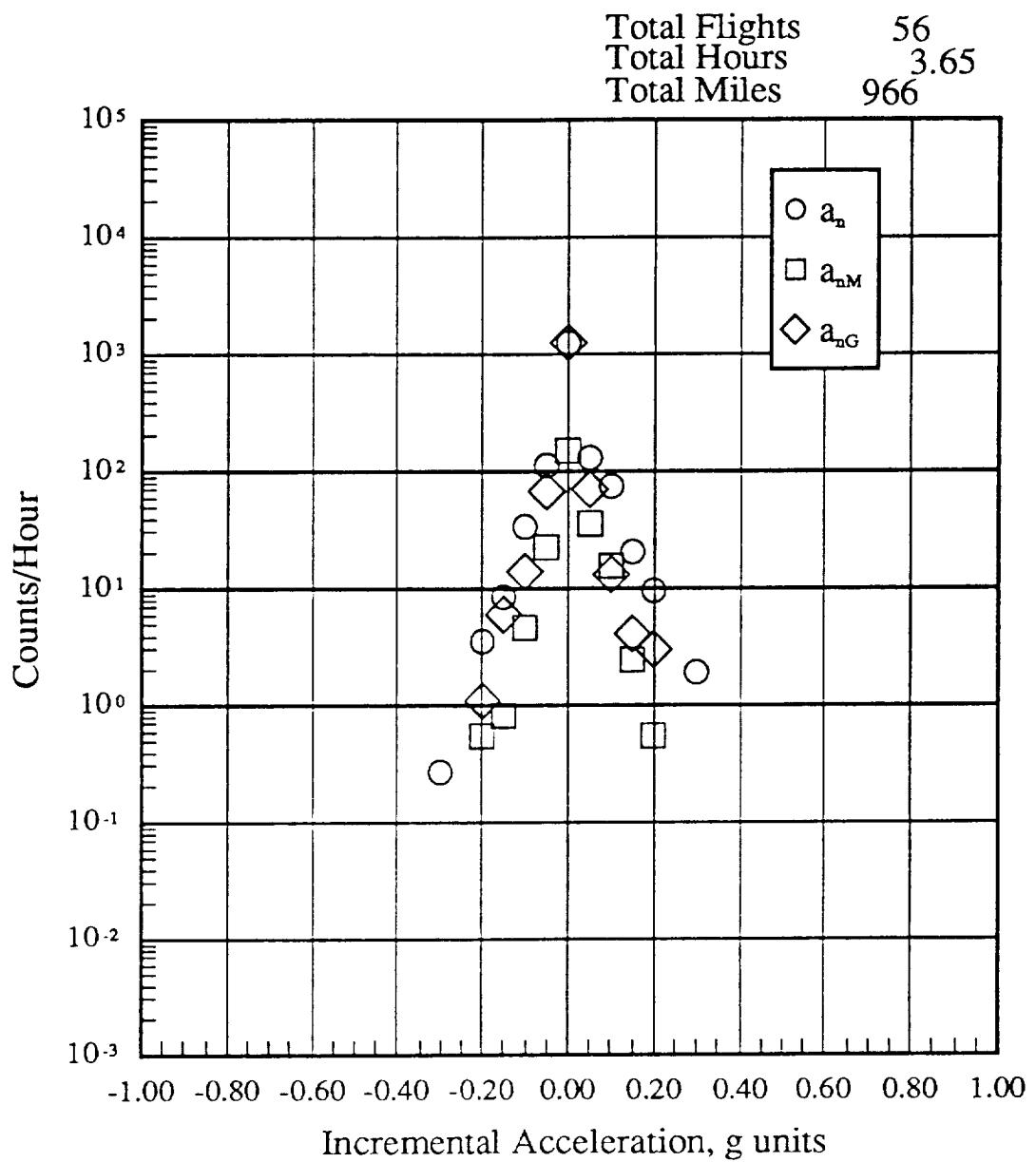
(c)  $a_{nG}$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Continued.



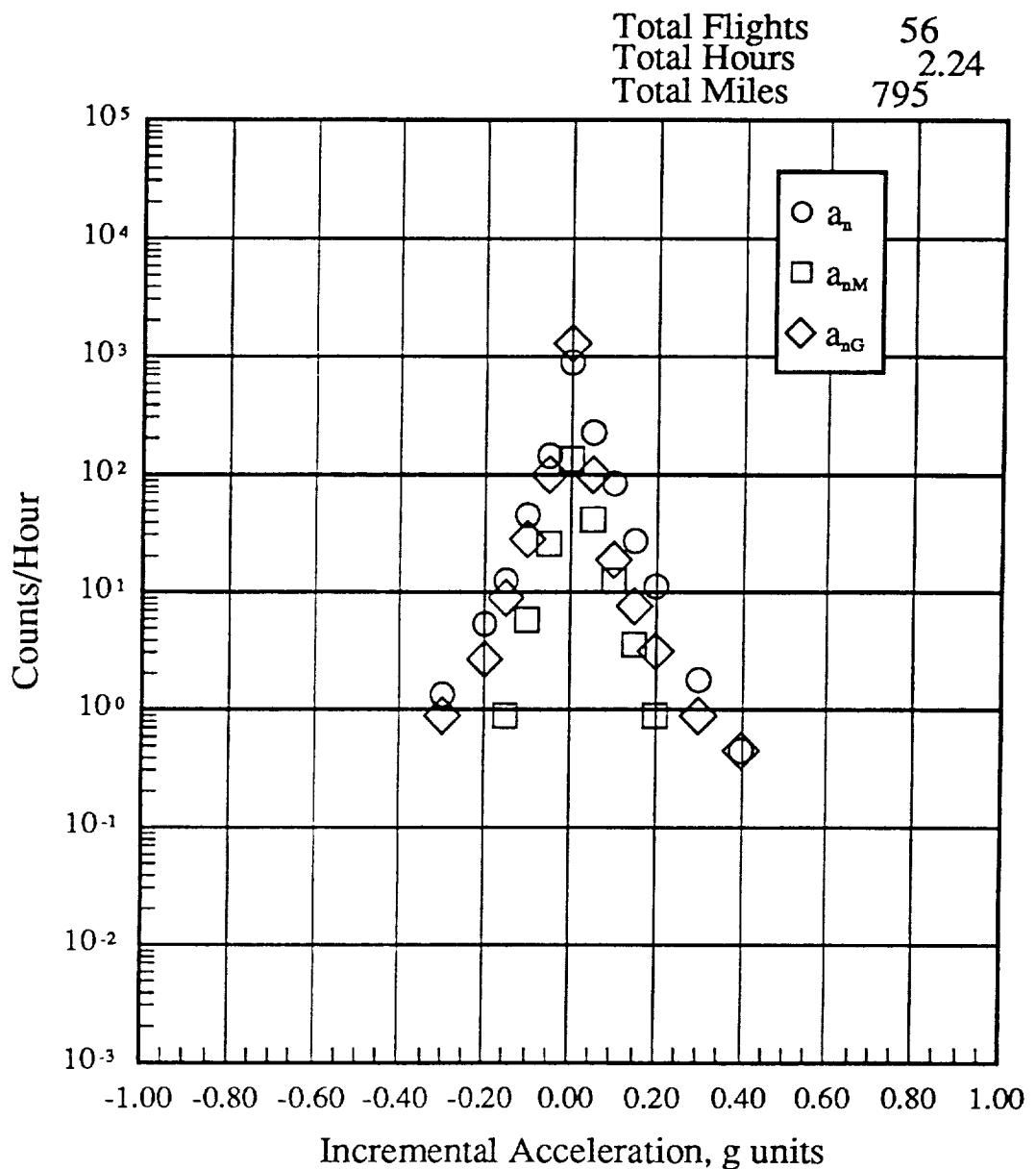
(d)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 4500 feet altitude

Figure 22.- Continued.



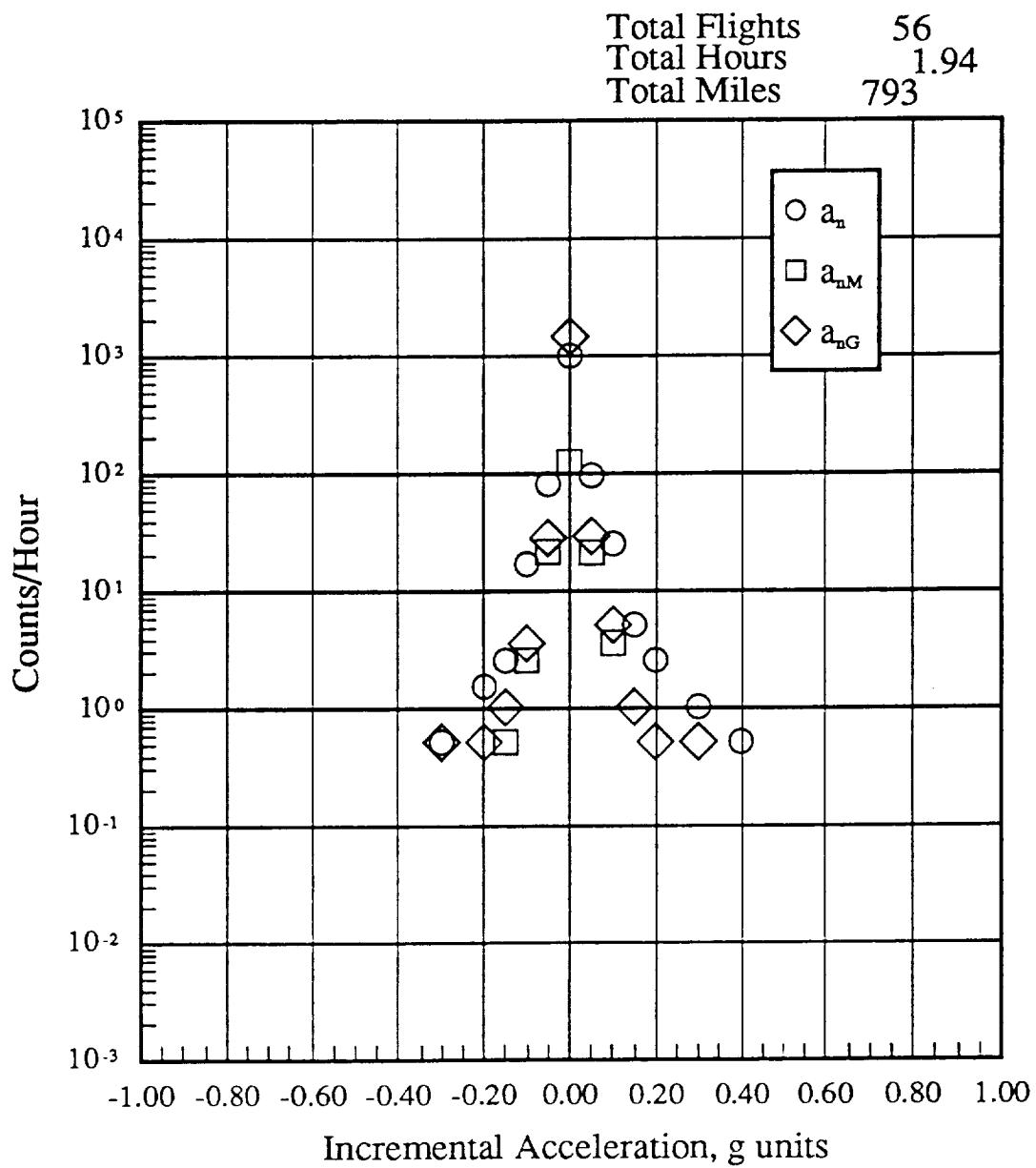
(e)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 4500 to 9500 feet altitude

Figure 22.- Continued.



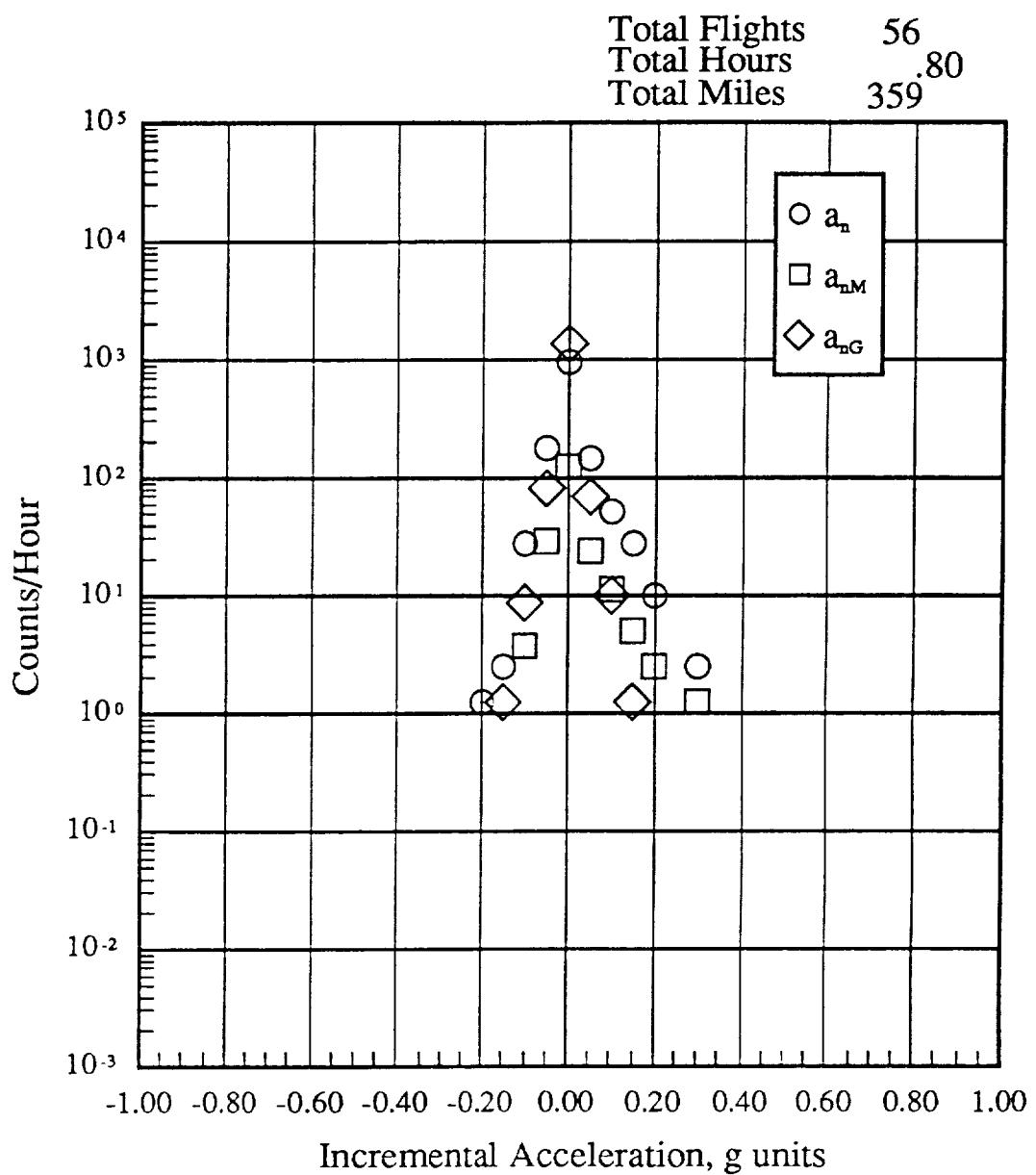
(f)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 9500 to 14500 feet altitude

Figure 22.- Continued.



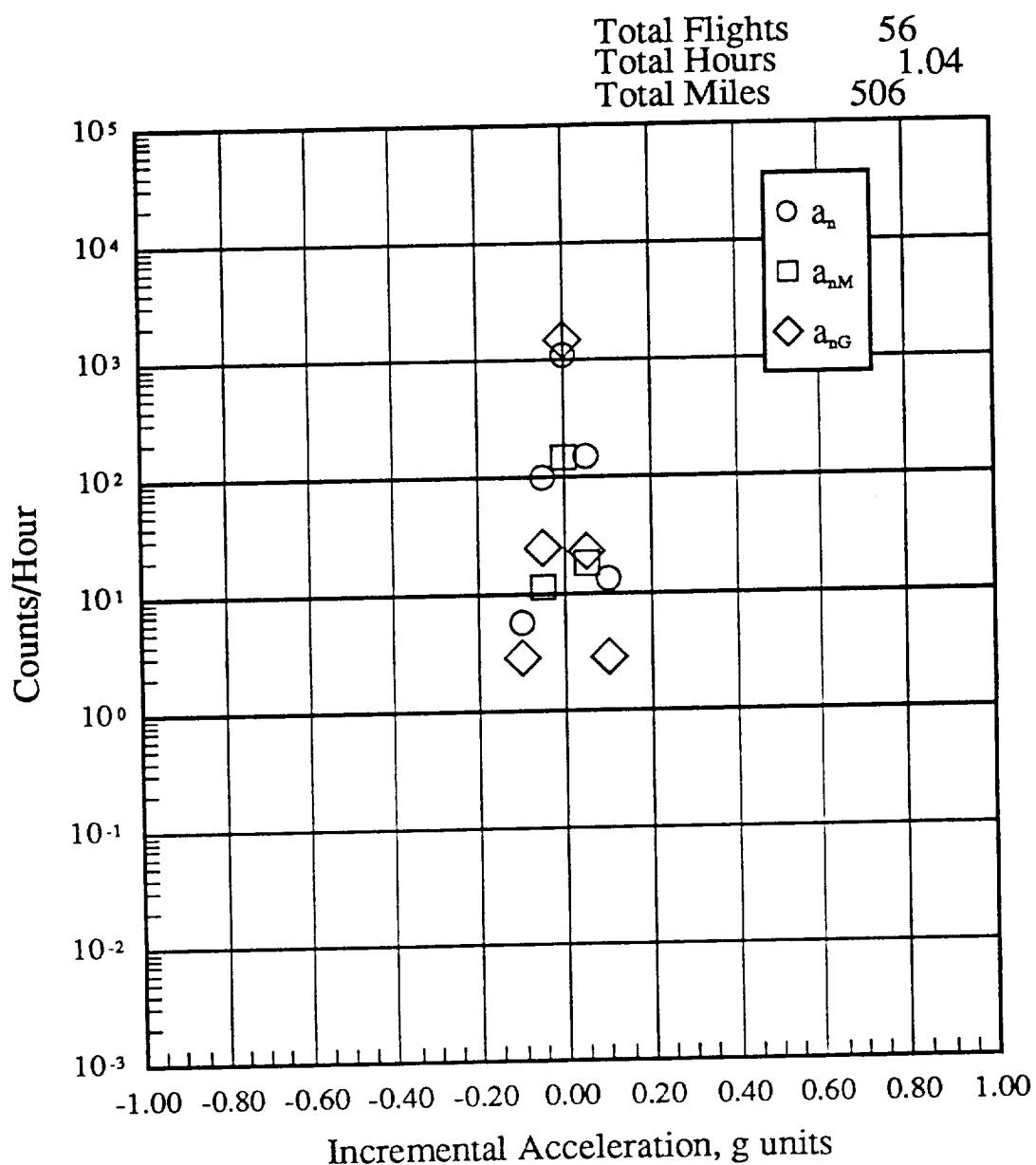
(g)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 14500 to 19500 feet altitude

Figure 22.- Continued.



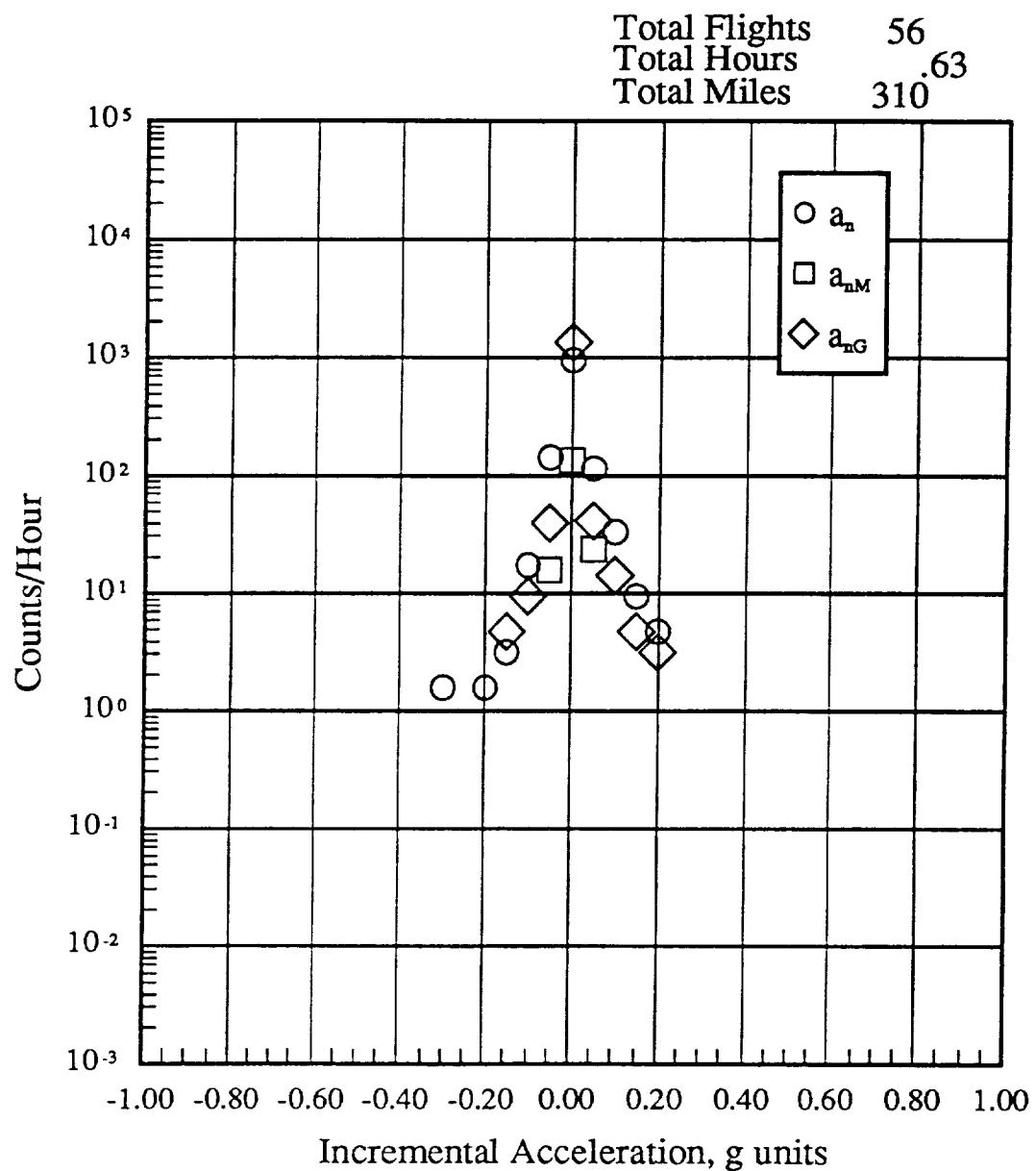
(h)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 19500 to 24500 feet altitude

Figure 22.- Continued.



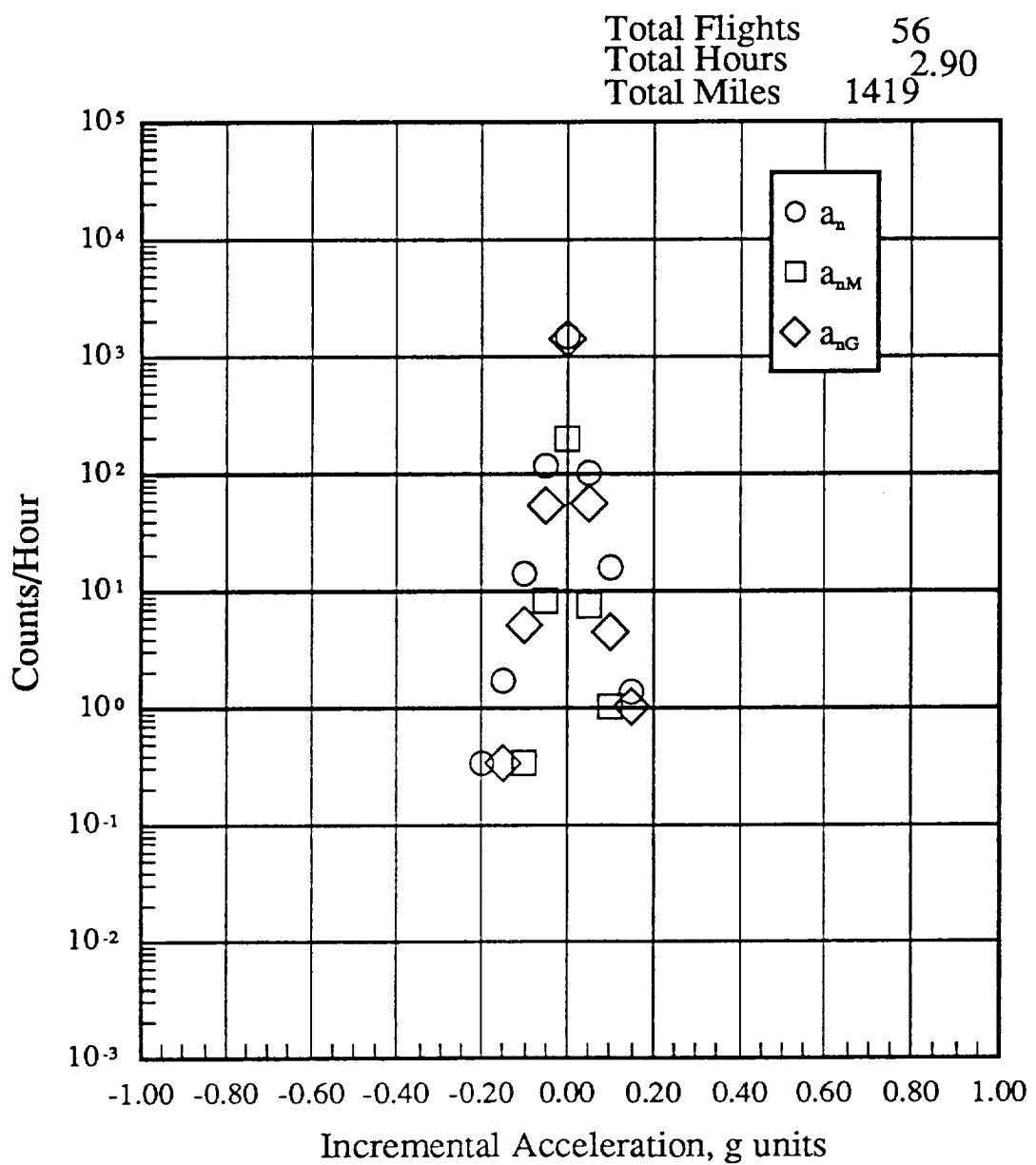
(i)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 24500 to 29500 feet altitude

Figure 22.- Continued.



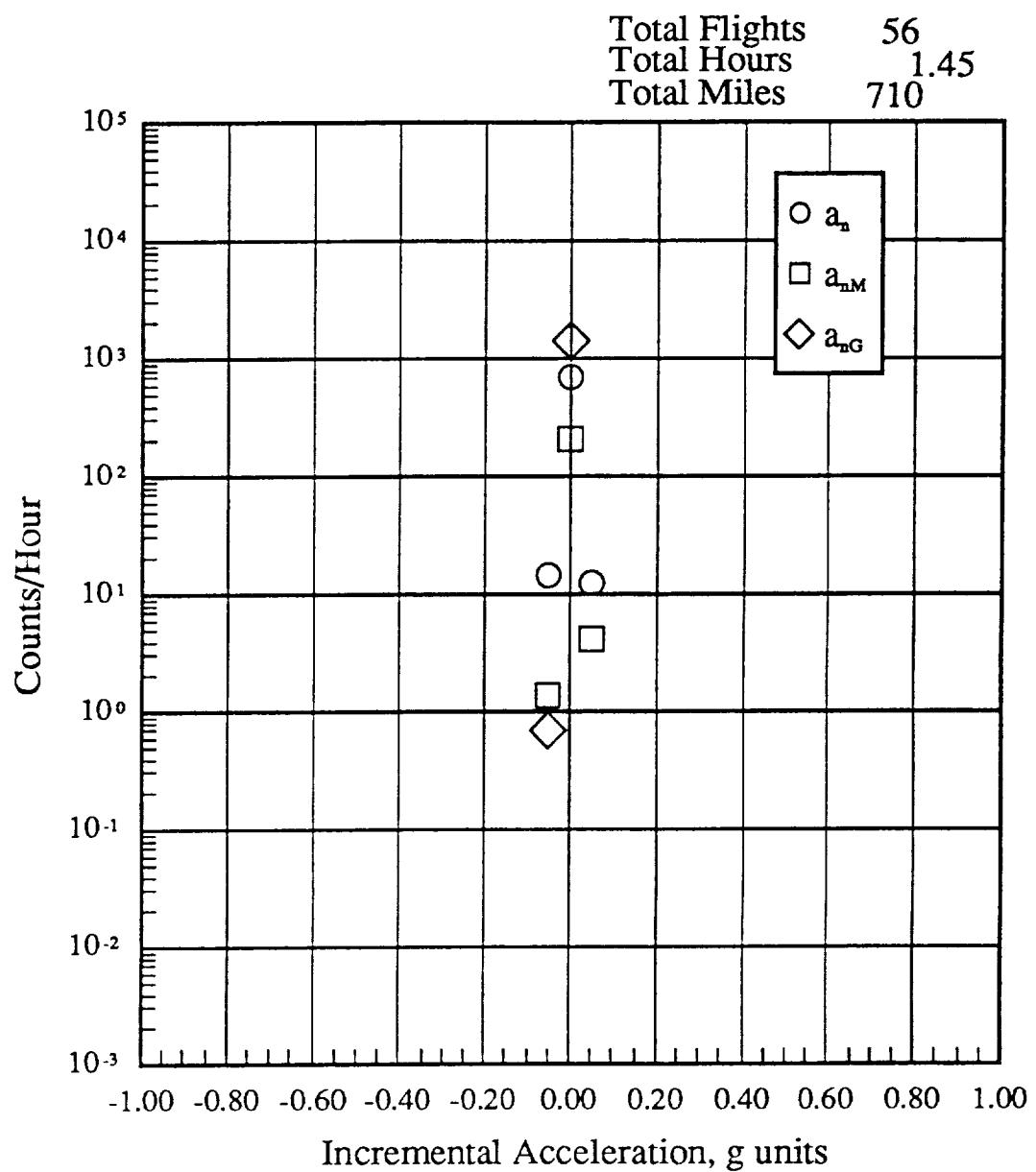
(j)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 29500 to 34500 feet altitude

Figure 22.- Continued.



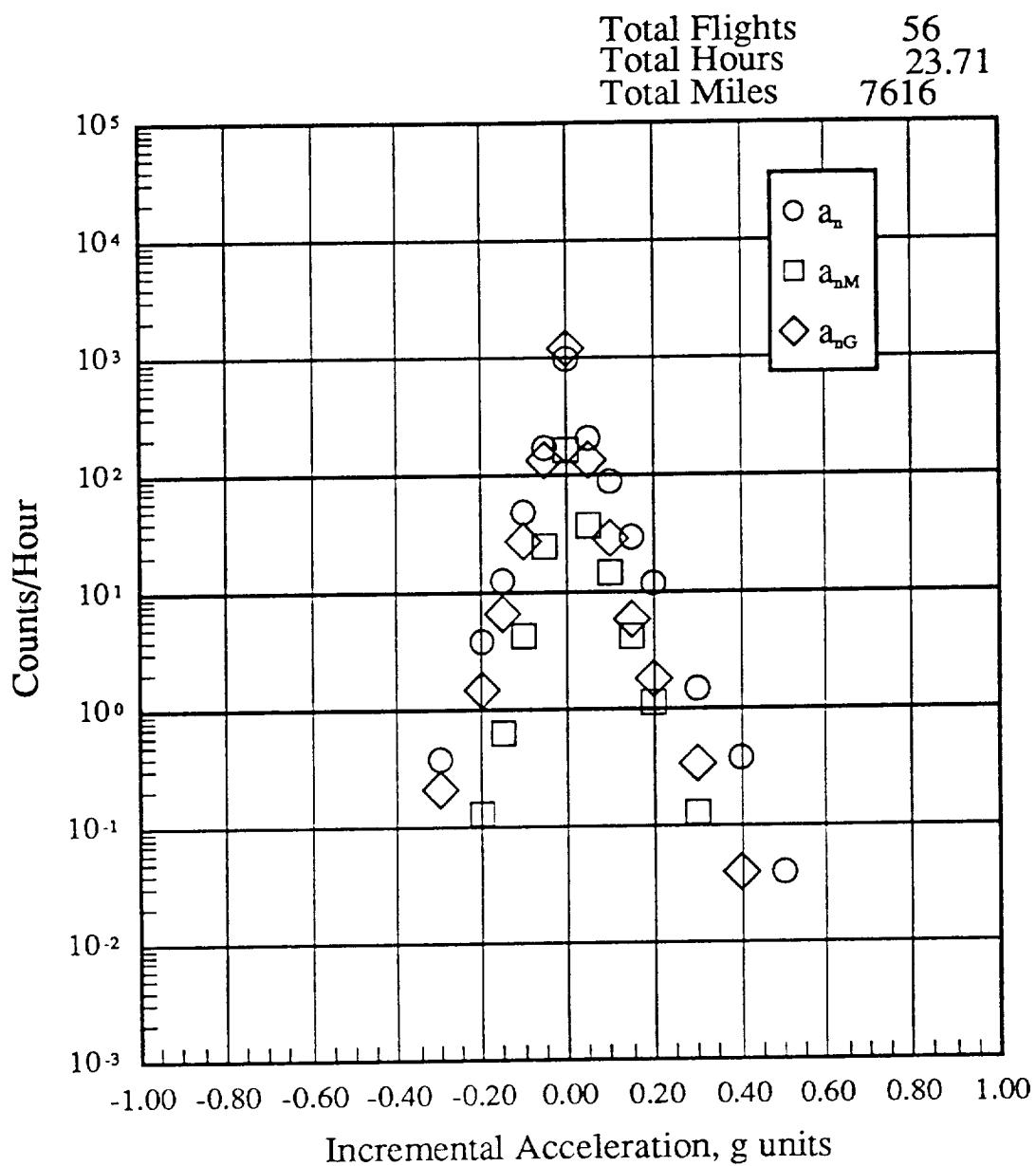
(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

Figure 22.- Continued.



(l)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 39500 to 44500 feet altitude

Figure 22.- Continued.



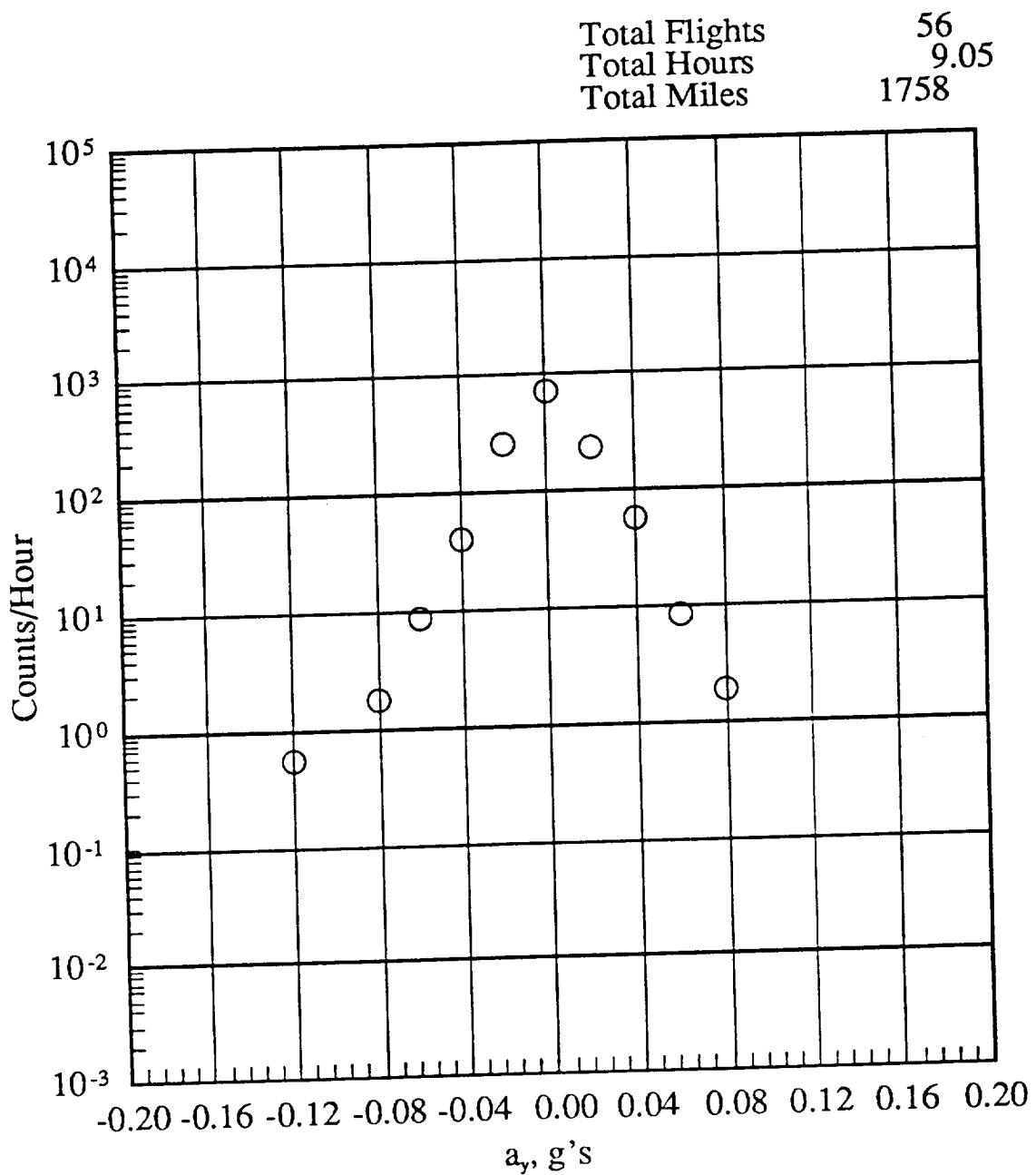
(m)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 44500 feet altitude

Figure 22.- Concluded.

$a_y$ LEVEL $g' s$	PRESSURE ALTITUDE BAND										-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 49500 FT	49500 TO -500 TO
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 49500 FT											
.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.08	1.88	1.10	0.45	3.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.06	8.40	2.47	3.13	1.55	1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.04	57.33	13.98	22.32	2.58	16.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.02	236.07	82.79	92.87	70.65	156.14	110.22	40.96	40.96	39.64	0	0	0	0	0	0	0	0	0	0	0	0
0	723.69	710.30	792.04	885.95	783.21	923.00	819.26	819.26	1419.66	1126.16	0	0	0	0	0	0	0	0	0	0	0
-.02	260.27	100.61	163.41	47.96	78.70	46.01	39.39	39.39	40.67	0	0	0	0	0	0	0	0	0	0	0	0
-.04	40.65	18.09	12.95	1.55	6.25	0.96	9.45	9.45	2.41	0	0	0	0	0	0	0	0	0	0	0	0
-.06	8.73	2.47	2.68	1.03	0	0	1.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.08	1.77	0.27	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.12	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS & ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	0	2.90	1.45	23.71										
FLIGHT MILES & ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26	56										
TOTAL FLIGHTS																					
TOTAL FLIGHT HOURS																					
TOTAL FLIGHT MILES																					

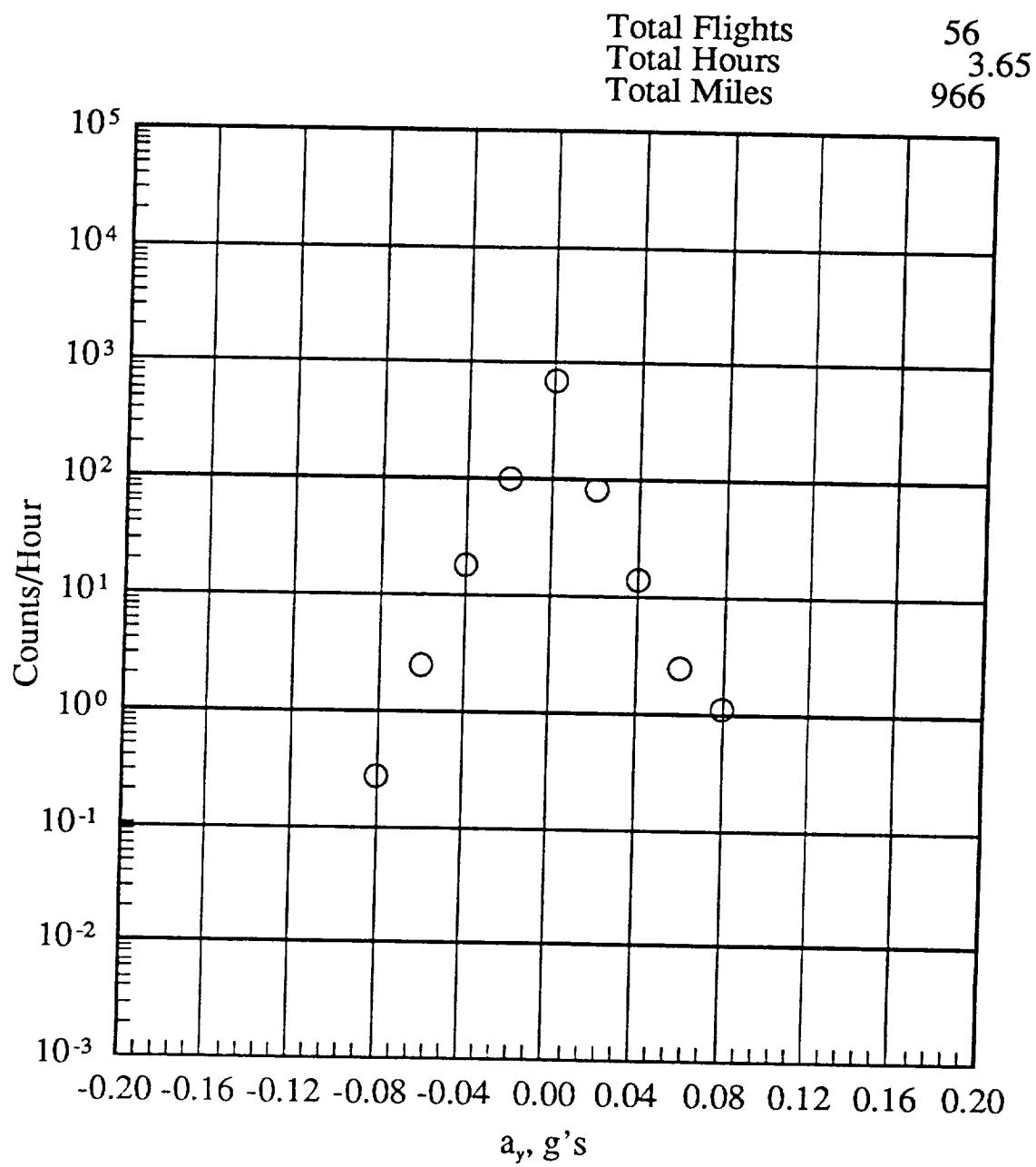
(a)  $a_y$  Level crossing counts per hour within pressure altitude bands

Figure 23.- Lateral acceleration exceedances: Nonrevenue flights.



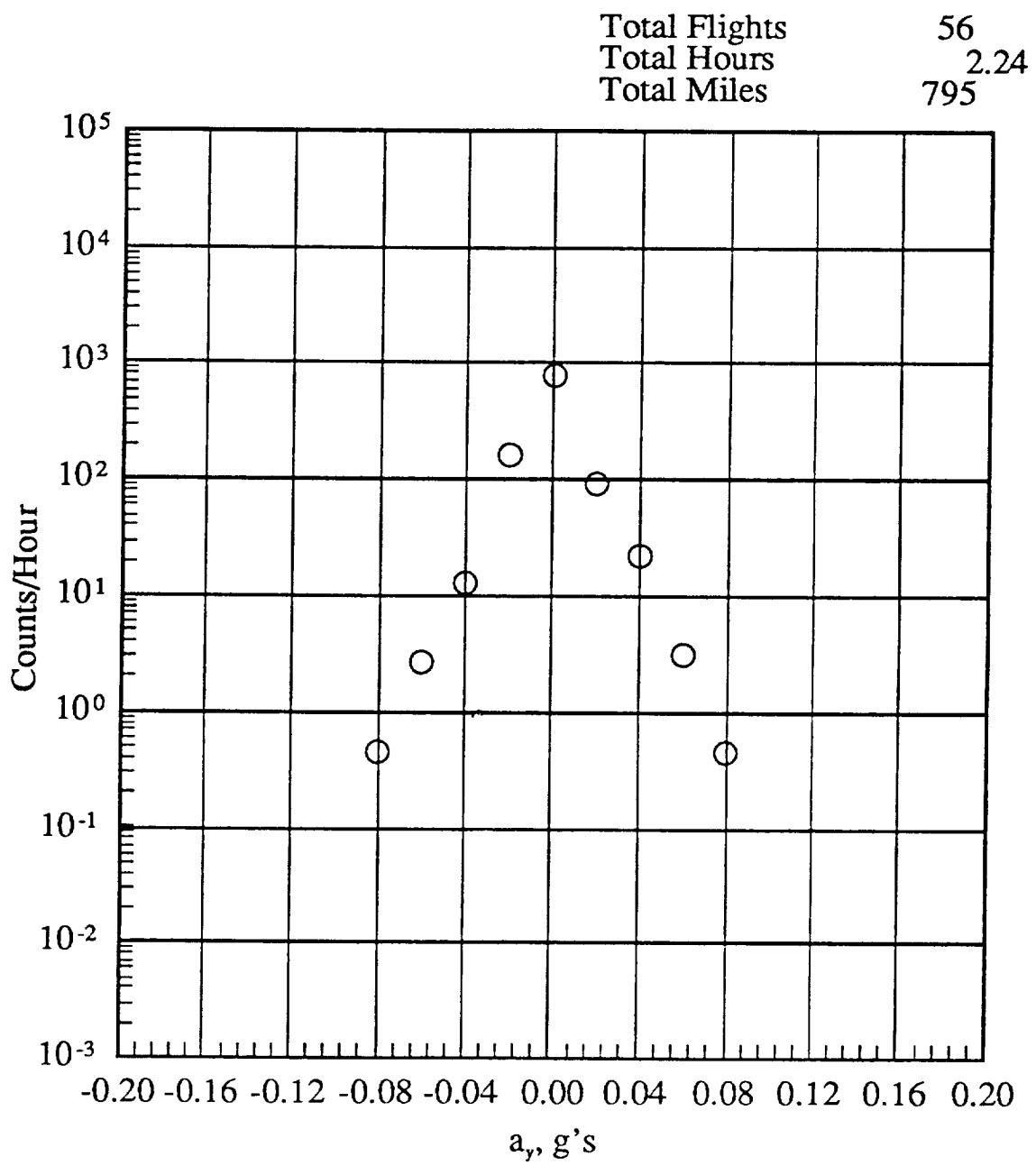
(b) -500 to 4500 feet altitude

Figure 23.- Continued.



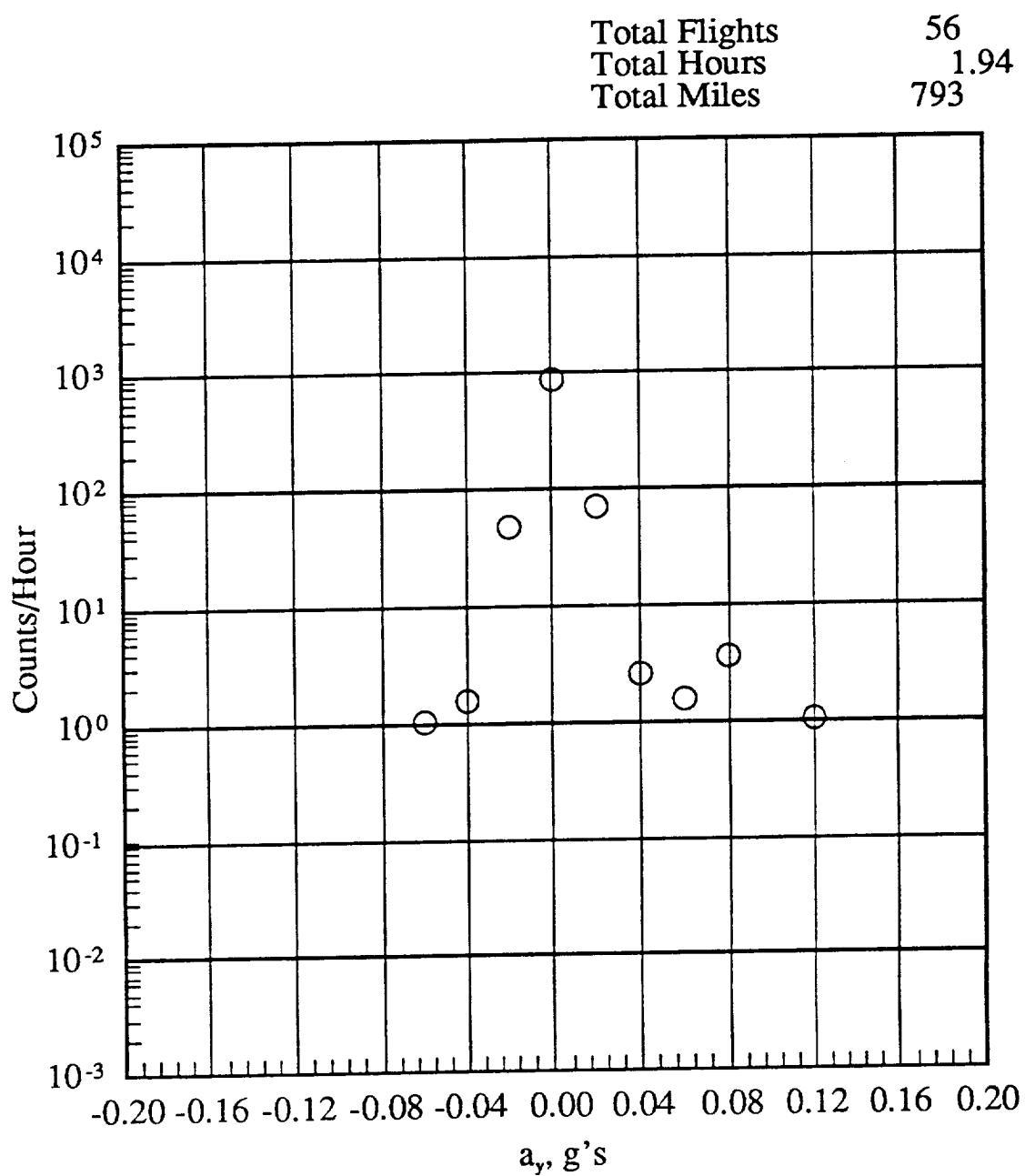
(c) 4500 to 9500 feet altitude

Figure 23.- Continued.



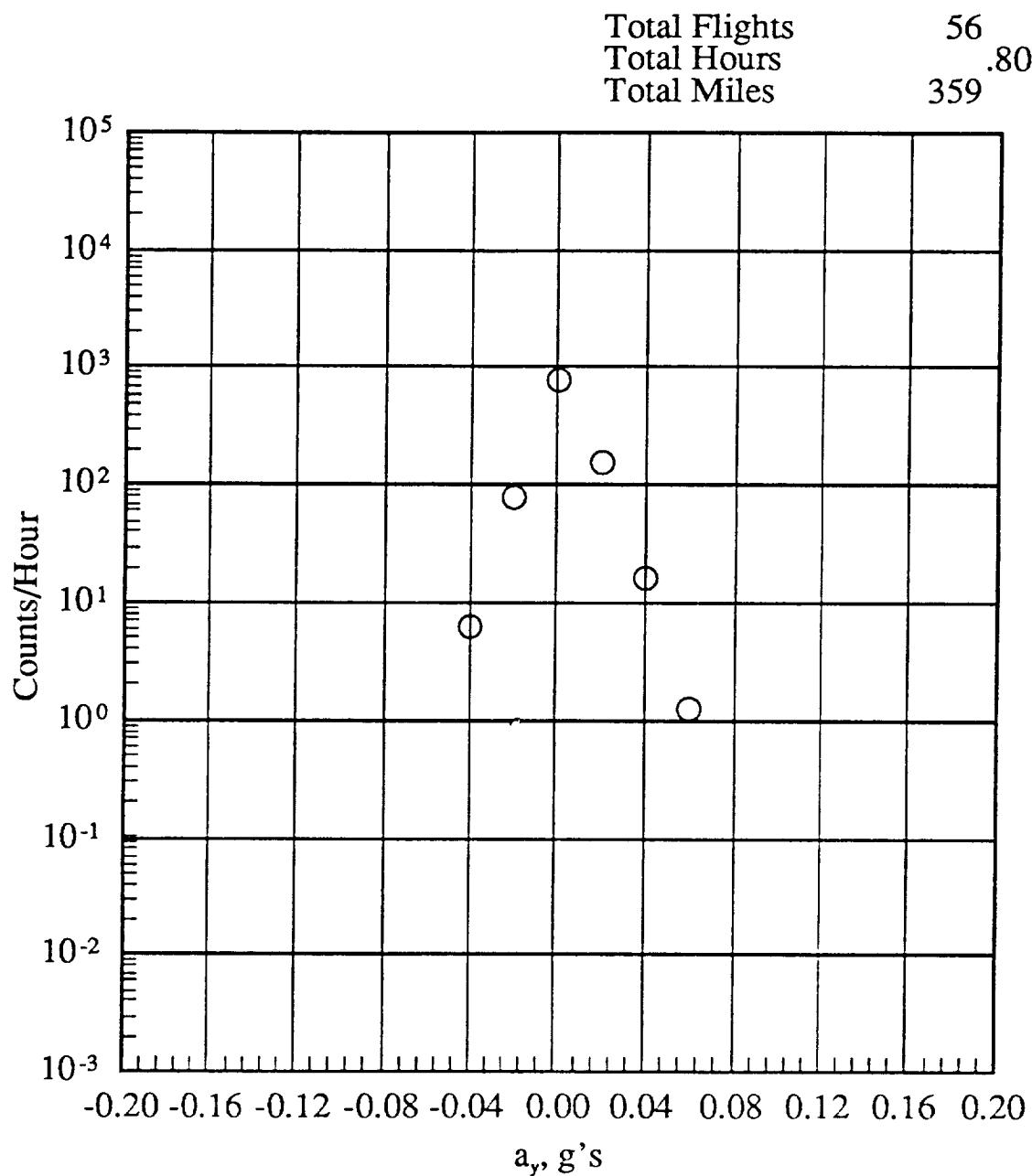
(d) 9500 to 14500 altitude

Figure 23.- Continued.



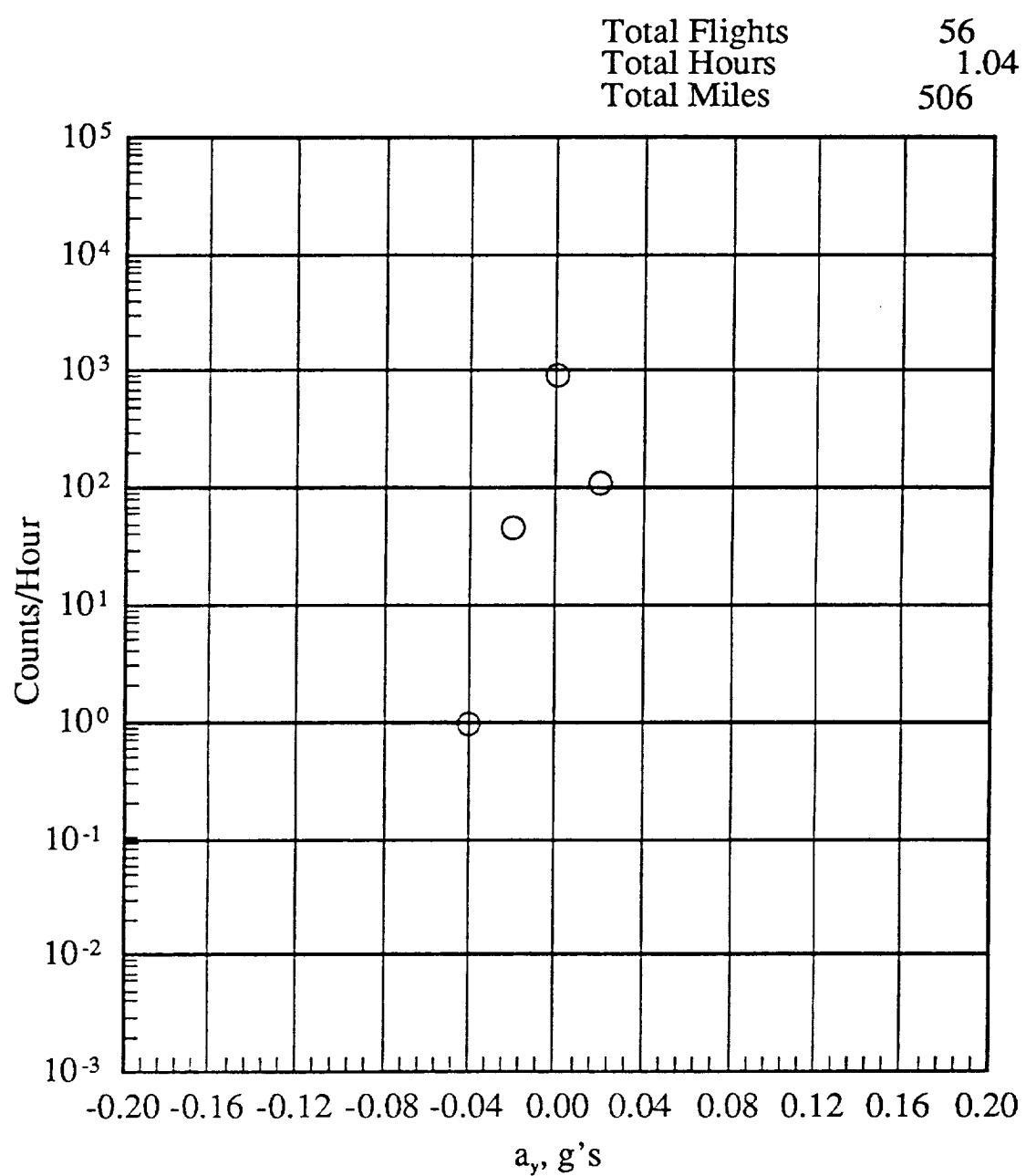
(e) 14500 to 19500 feet altitude

Figure 23.- Continued.



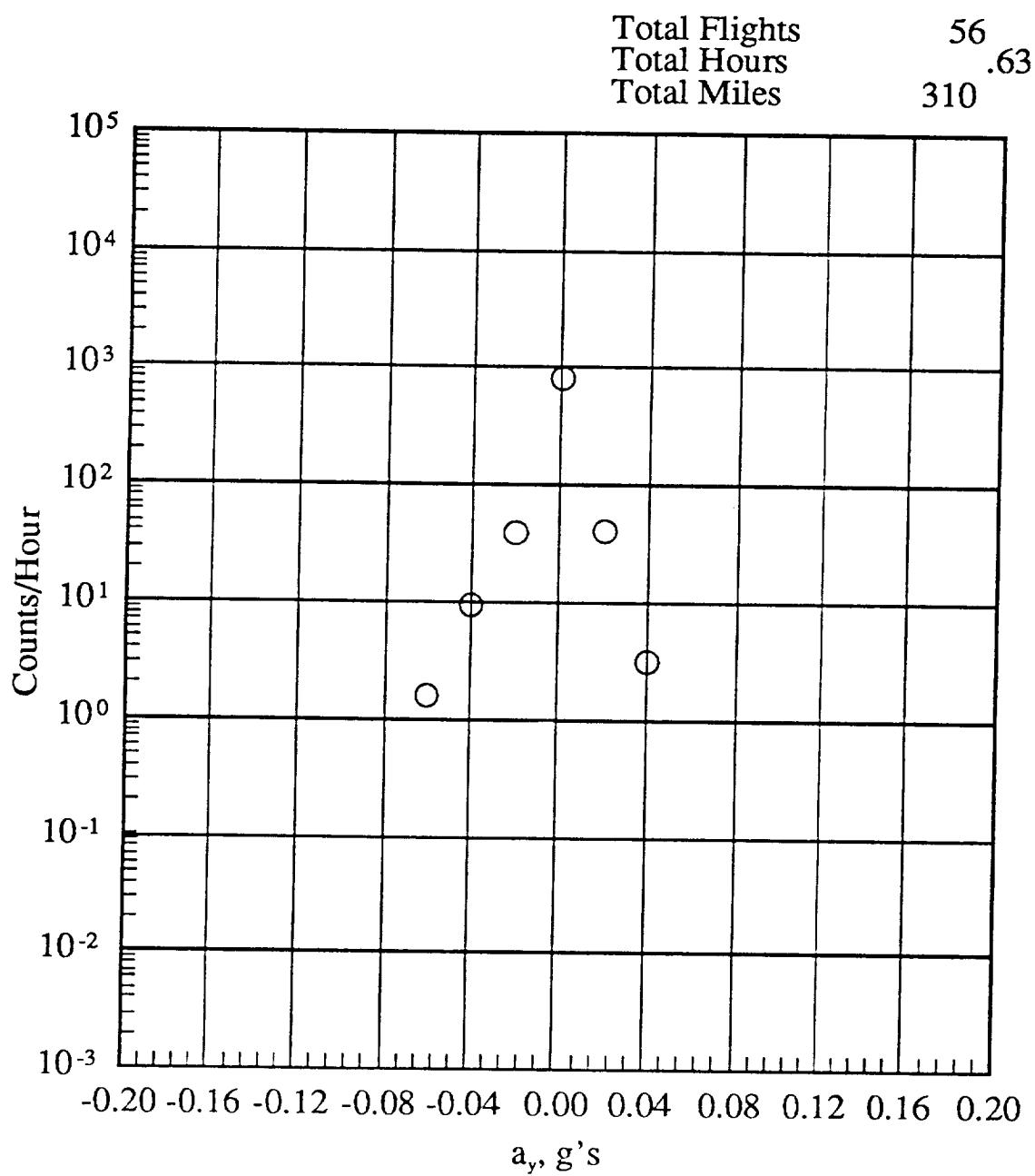
(f) 19500 to 24500 feet altitude

Figure 23.- Continued.



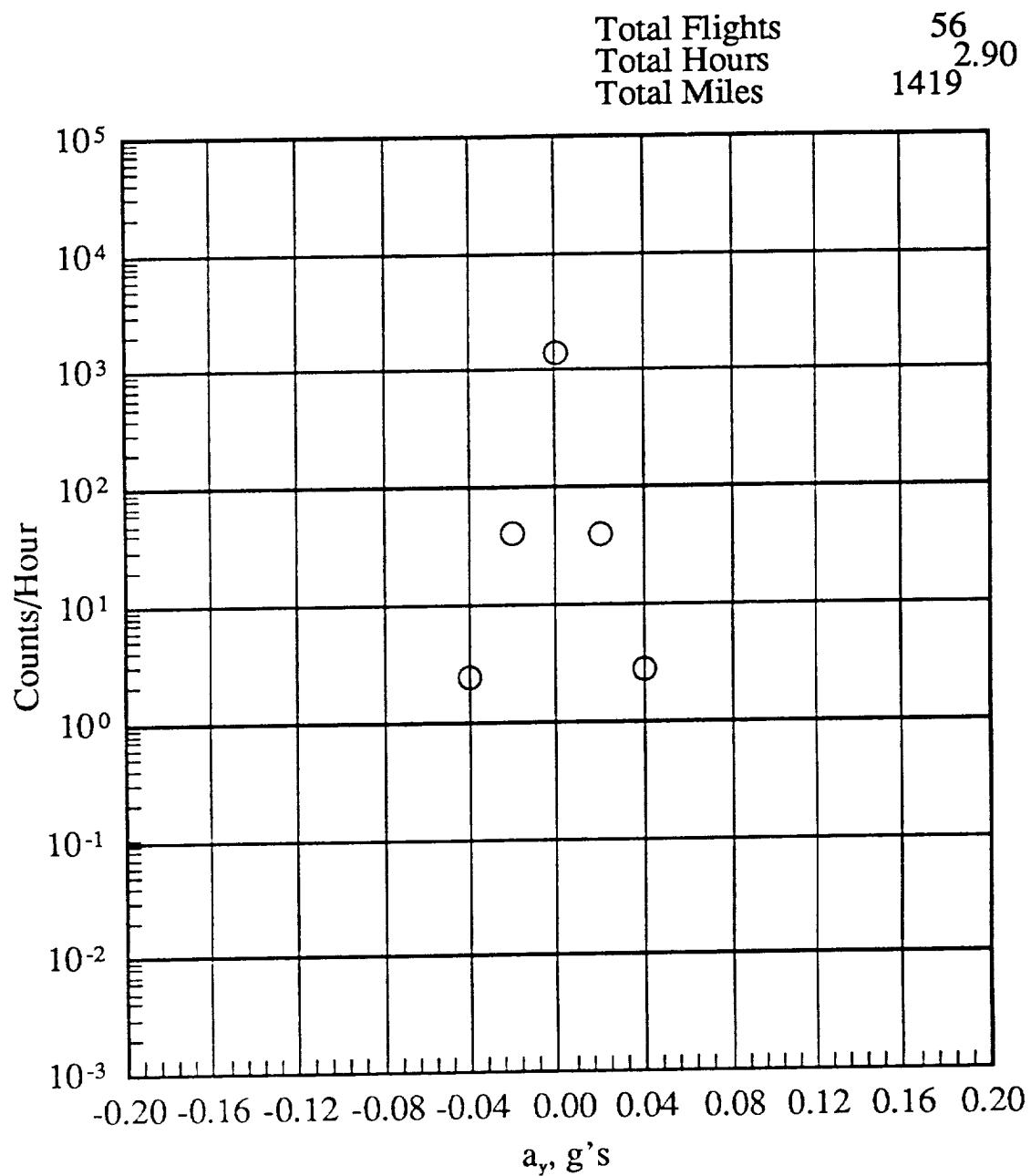
(g) 24500 to 29500 feet altitude

Figure 23.- Continued.



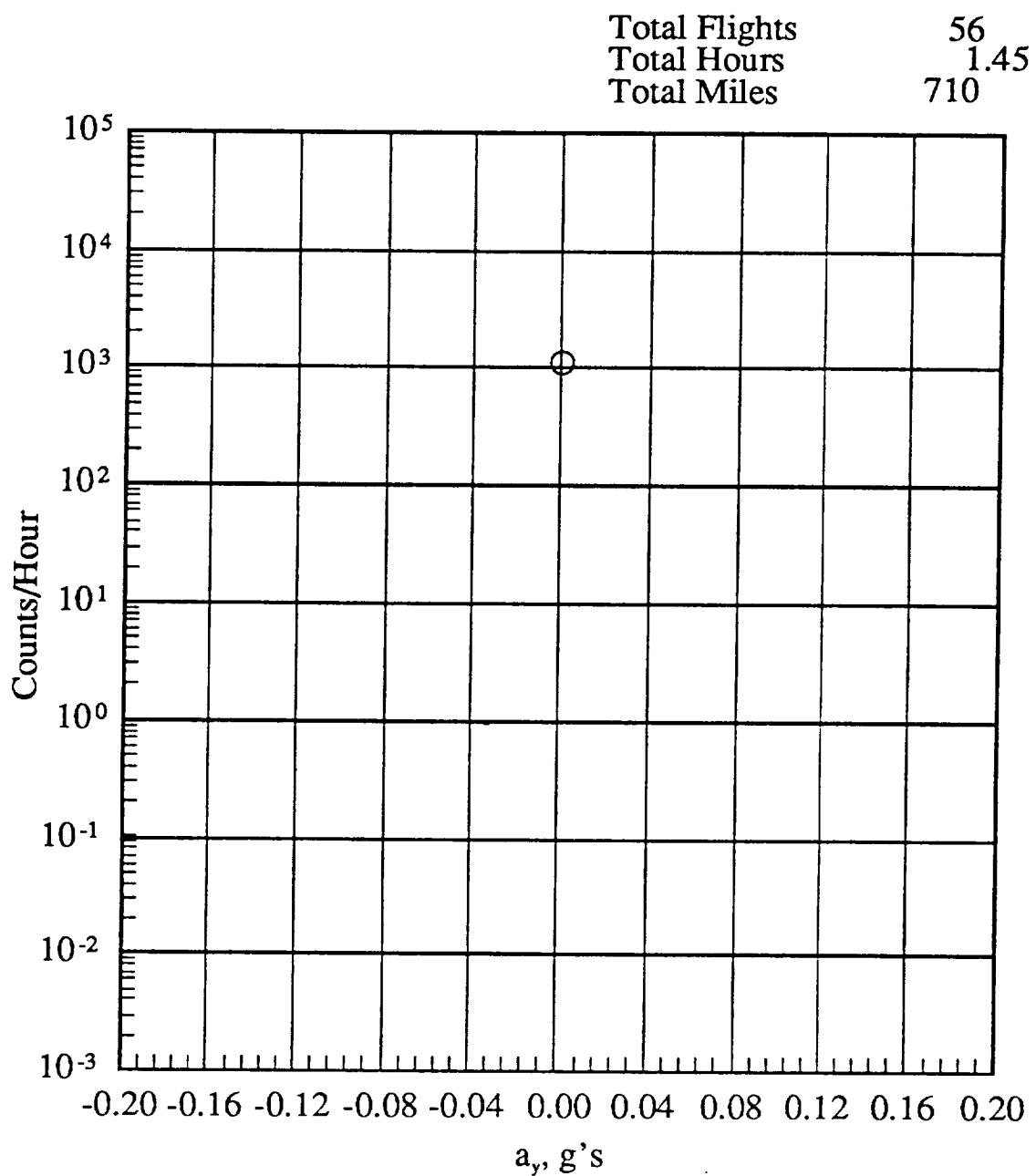
(h) 29500 to 34500 feet altitude

Figure 23.- Continued.



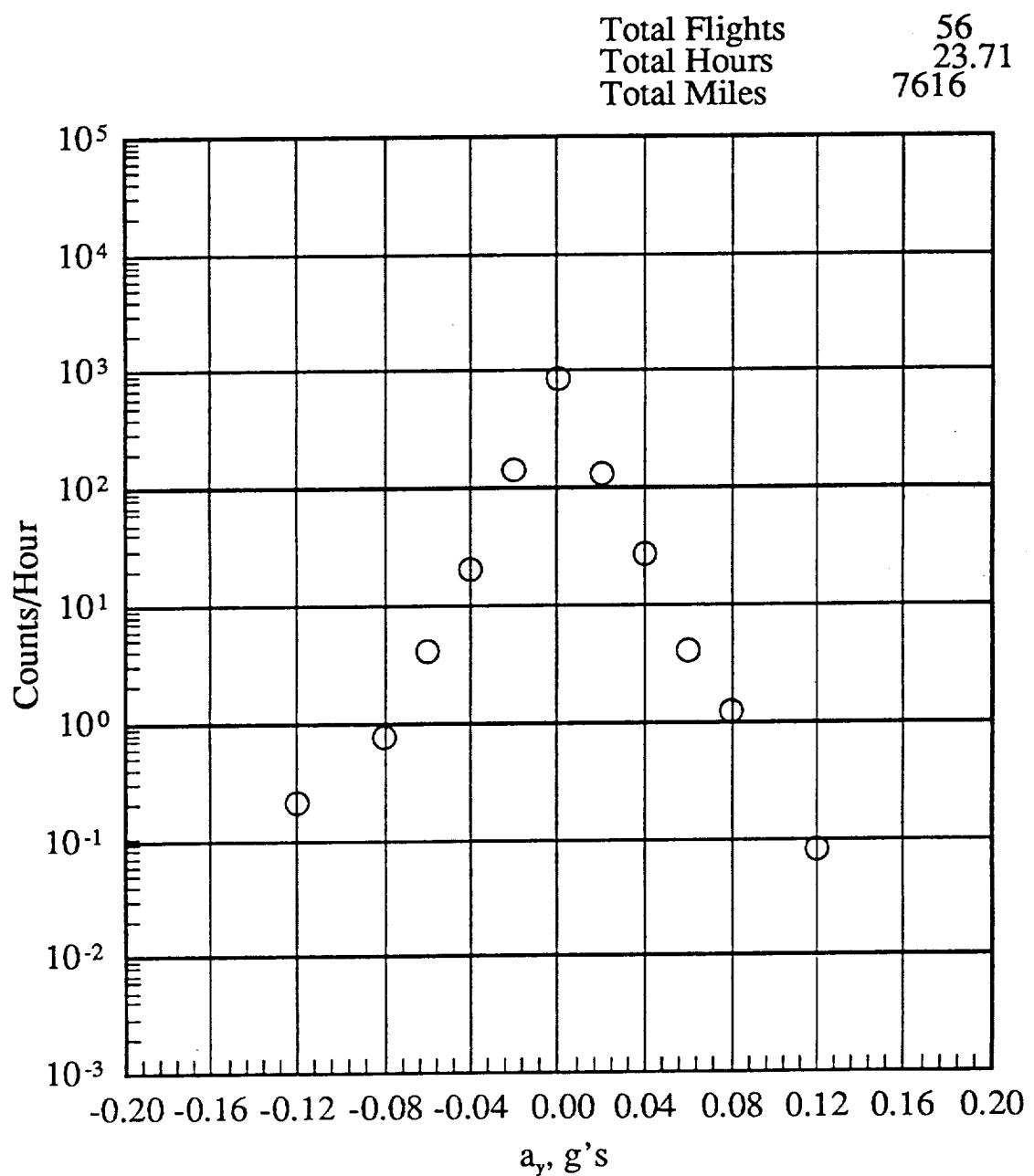
(i) 34500 to 39500 feet altitude

Figure 23.- Continued.



(j) 39500 to 44500 feet altitude

Figure 23.- Continued.



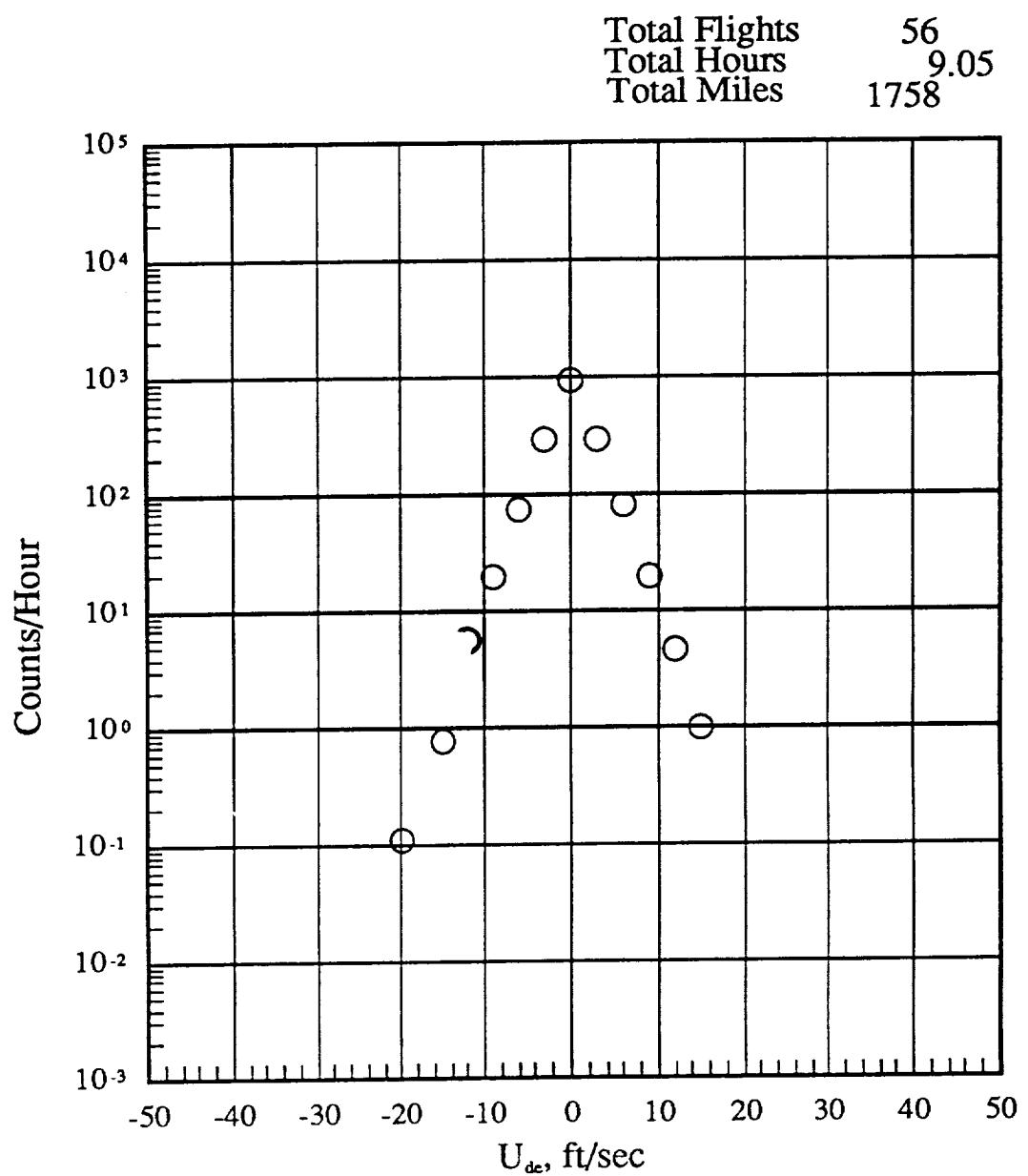
(k) -500 to 44500 feet altitude

Figure 23.- Concluded

		PRESSURE ALTITUDE BAND									
$U_{de}$	DERIVED GUST VELOCITY LEVEL FT/SEC	4500 TO 4500 FT	9500 TO 9500 FT	14500 TO 14500 FT	19500 TO 19500 FT	24500 TO 24500 FT	29500 TO 29500 FT	34500 TO 34500 FT	39500 TO 39500 FT	-500 TO 44500 FT	
100	0	0	0	0	0	0	0	0	0	0	
90	0	0	0	0	0	0	0	0	0	0	
80	0	0	0	0	0	0	0	0	0	0	
70	0	0	0	0	0	0	0	0	0	0	
60	0	0	0	0	0	0	0	0	0	0	
50	0	0	0	0	0	0	0	0	0	0	
40	0	0	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	0	0	
15	0.99	0	0.89	0	0	0	0	0	0	0	
12	4.64	0.27	0.89	0	0	0	0	0	0	0.46	
9	19.55	3.02	2.68	0.52	0	0	0	0	0	1.90	
6	80.75	7.40	7.59	1.03	0	0	0	0	0	8.23	
3	293.08	41.94	40.63	7.74	12.49	0	3.15	1.03	0	32.98	
0	938.44	1256.66	1288.96	1466.61	1366.59	1478.91	1350.50	1416.56	1419.44	124.68	
-3	292.75	41.40	42.86	4.64	13.74	1.92	11.03	6.89	0	1200.90	
-6	74.35	8.22	10.72	0.52	0	0	0	0.34	0	124.26	
-9	19.55	1.92	2.23	0.52	0	0	0	0	0	30.75	
-12	5.63	0.27	1.34	0	0	0	0	0	0	8.01	
-15	0.77	0	0.45	0	0	0	0	0	0	2.32	
-20	0.11	0	0	0	0	0	0	0	0	0.34	
-30	0	0	0	0	0	0	0	0	0	0.04	
-40	0	0	0	0	0	0	0	0	0	0	
-50	0	0	0	0	0	0	0	0	0	0	
-60	0	0	0	0	0	0	0	0	0	0	
-70	0	0	0	0	0	0	0	0	0	0	
-80	0	0	0	0	0	0	0	0	0	0	
-90	0	0	0	0	0	0	0	0	0	0	
-100	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71	
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26	
TOTAL FLIGHTS										56	
TOTAL FLIGHT HOURS FLAPS UP A										23.71	
TOTAL FLIGHT MILES FLAPS UP AND DOWN										7616.26	

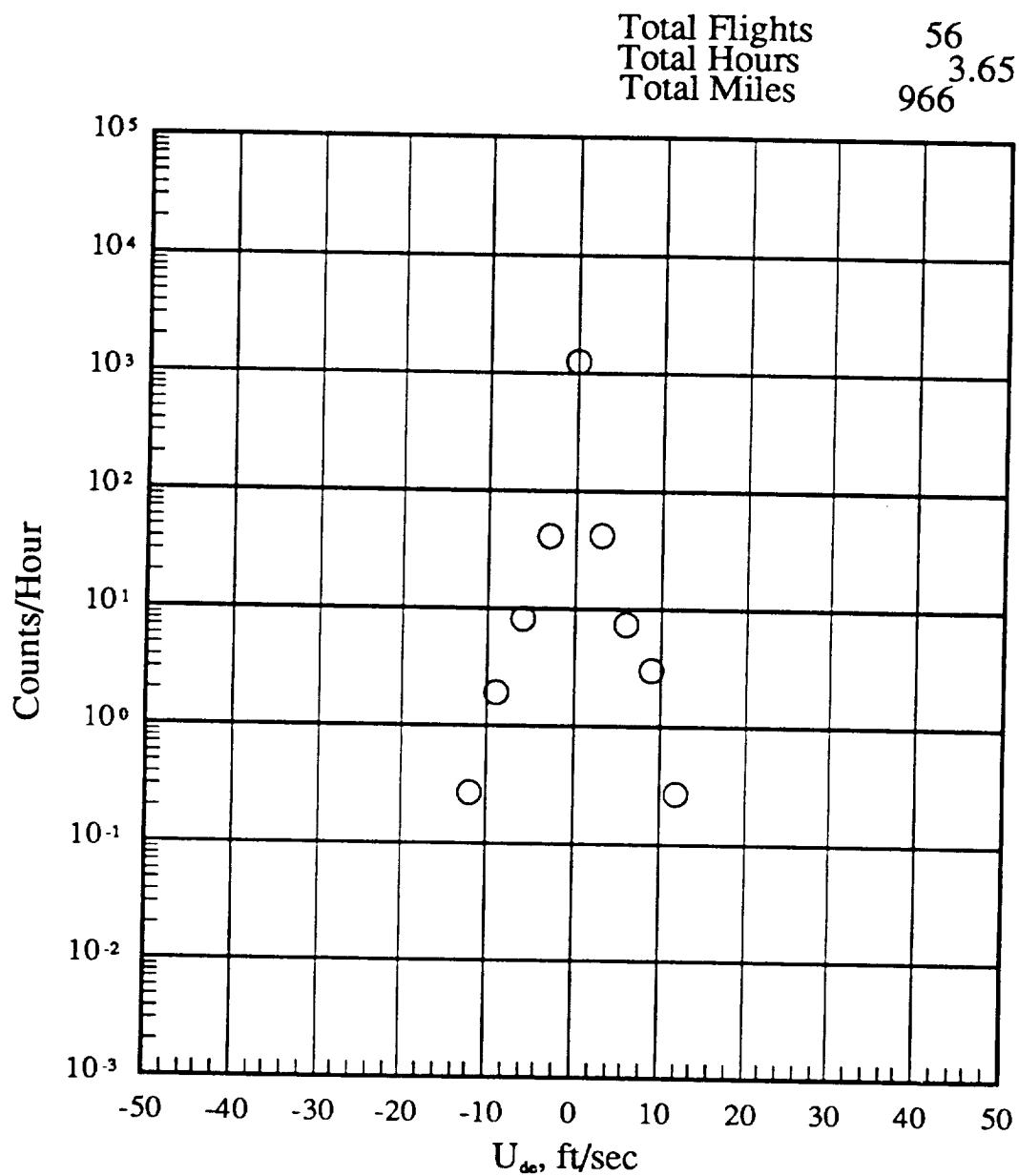
(a)  $U_{de}$  Level crossing counts per hour within pressure altitude bands

Figure 24.-  $U_{de}$  exceedances: Nonrevenue flights.



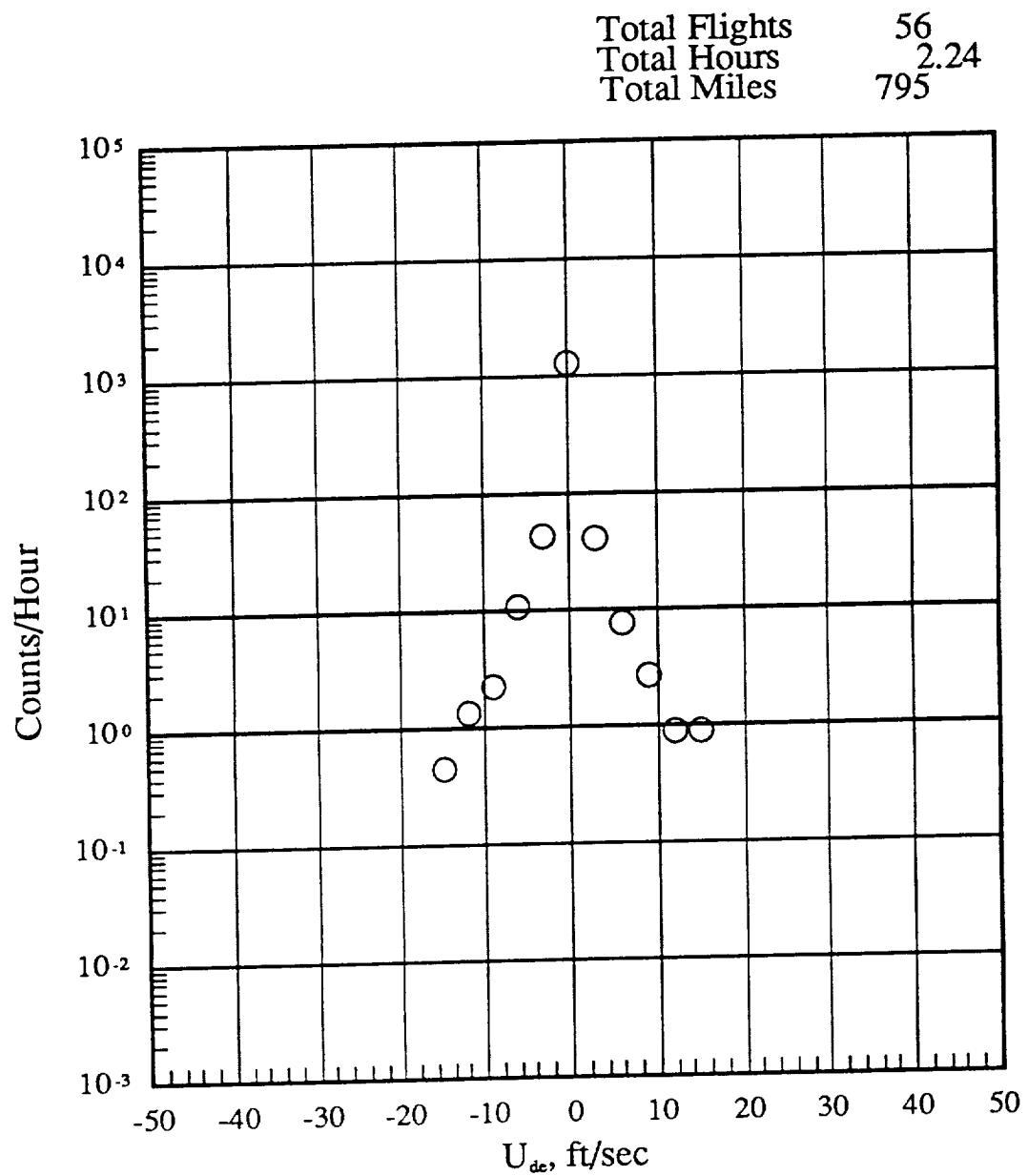
(b) -500 to 4500 feet altitude

Figure 24.- Continued.



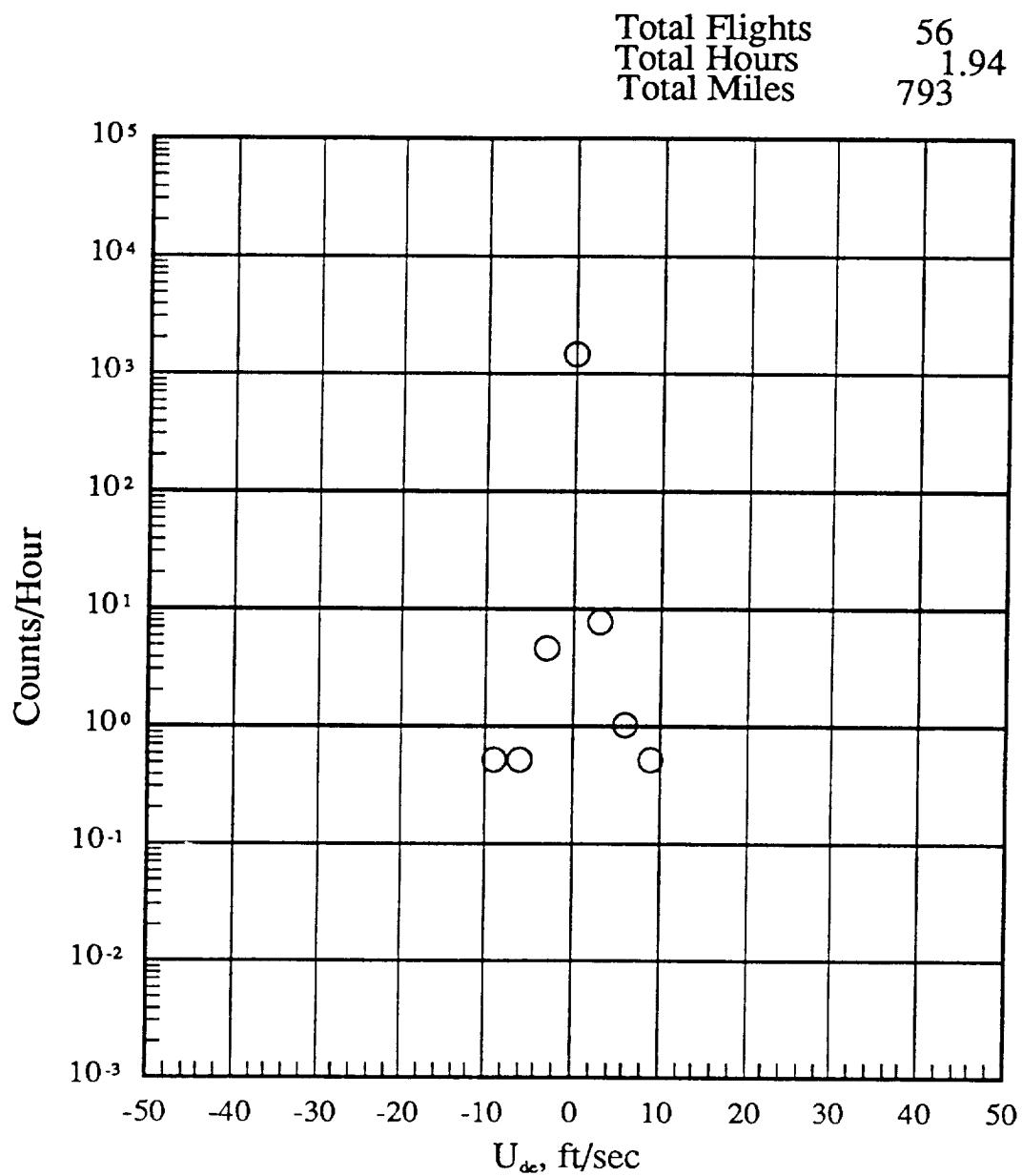
(c) 4500 to 9500 feet altitude

Figure 24.- Continued.



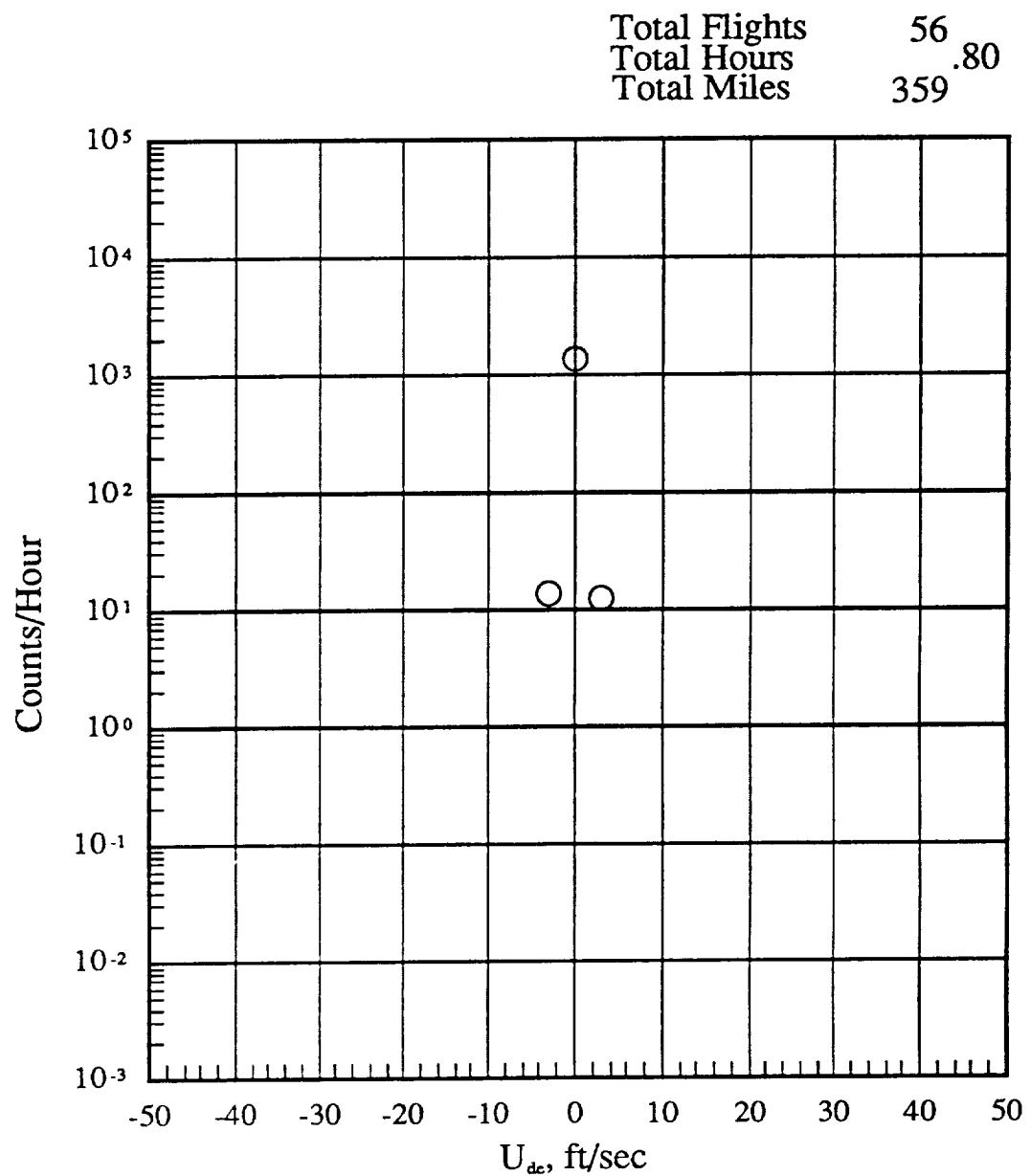
(d) 9500 to 14500 feet altitud

Figure 24.- Continued.



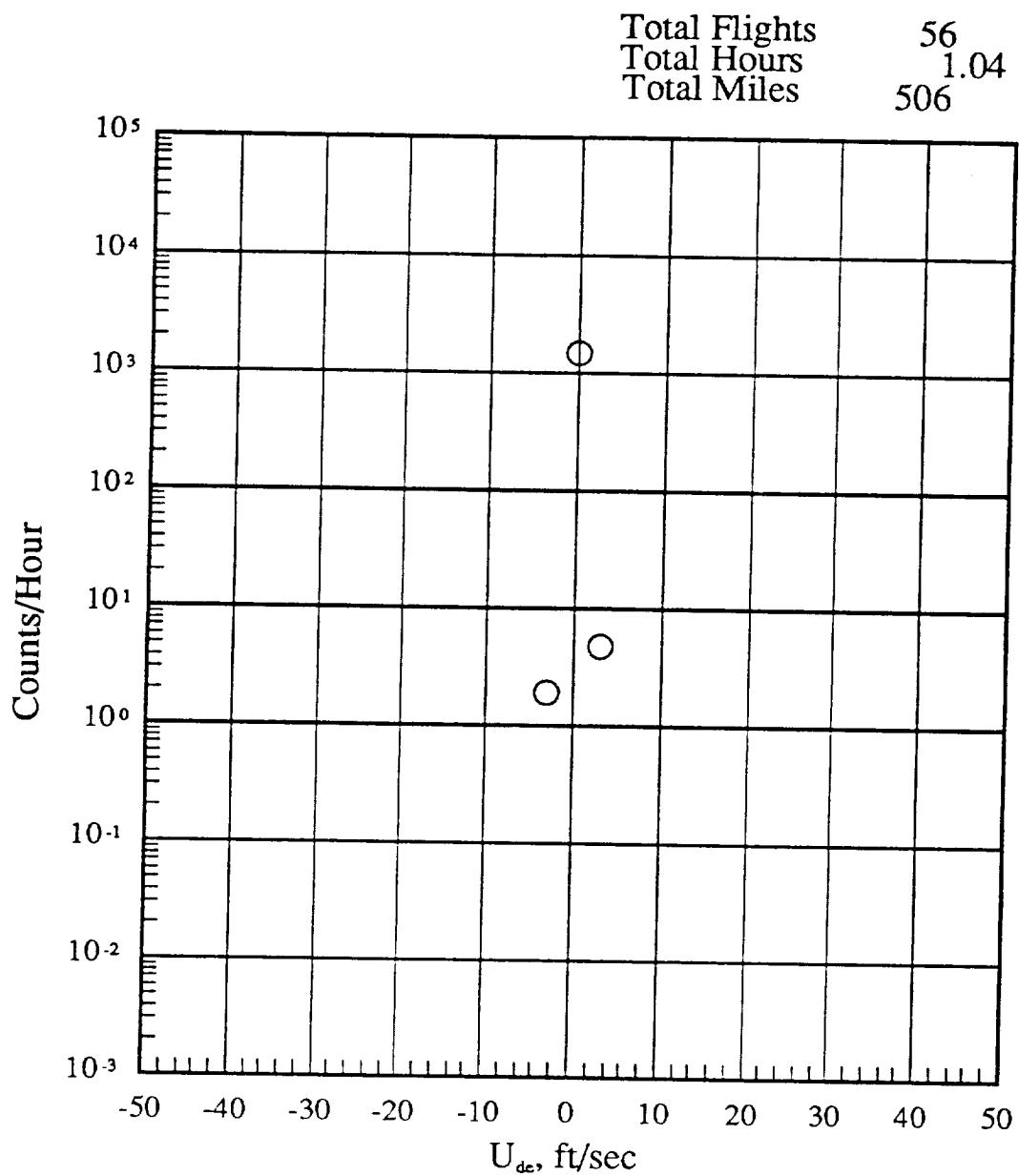
(e) 14500 to 19500 feet altitude

Figure 24.- Continued.



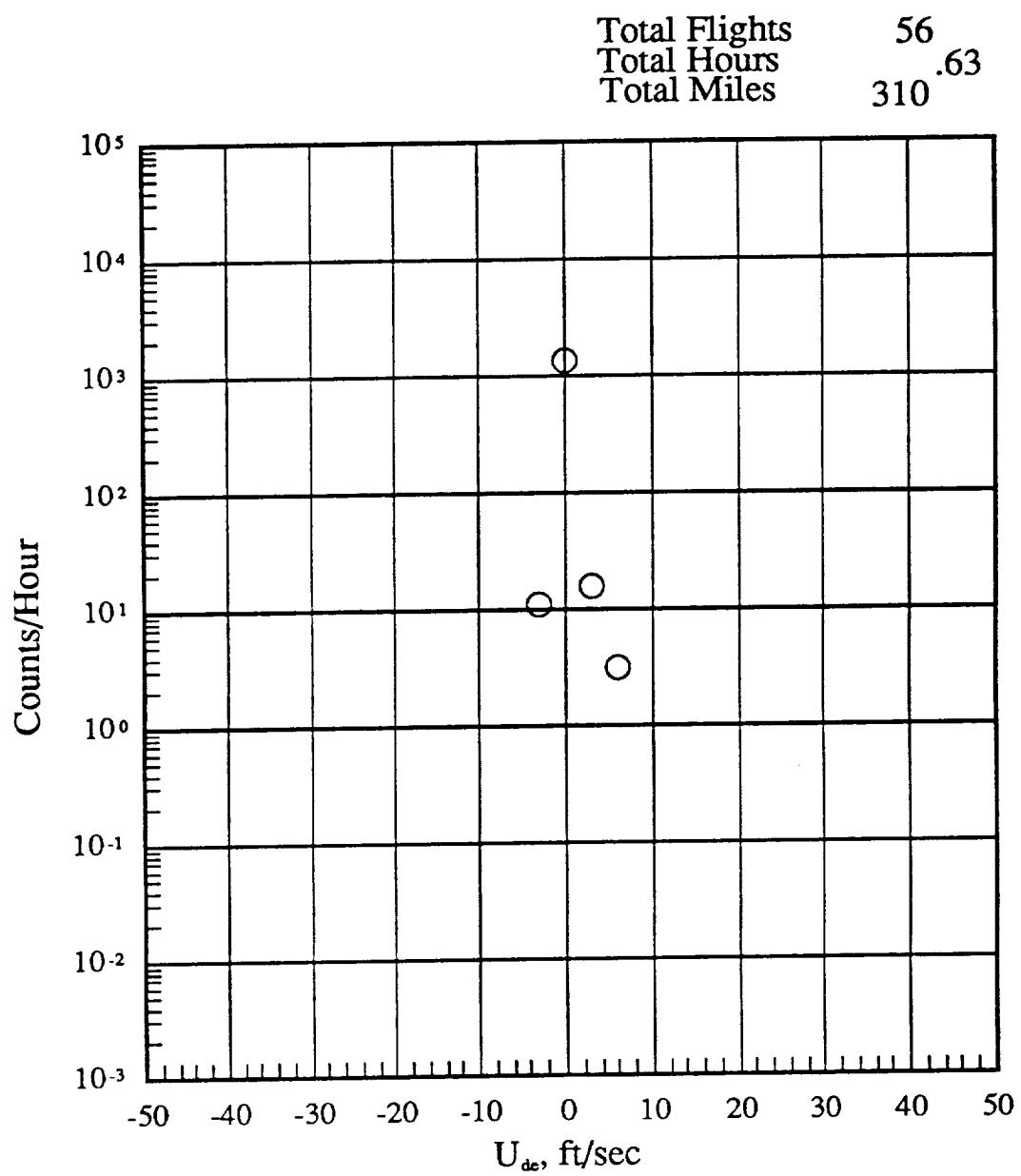
(f) 19500 to 24500 feet altitude

Figure 24.- Continued.



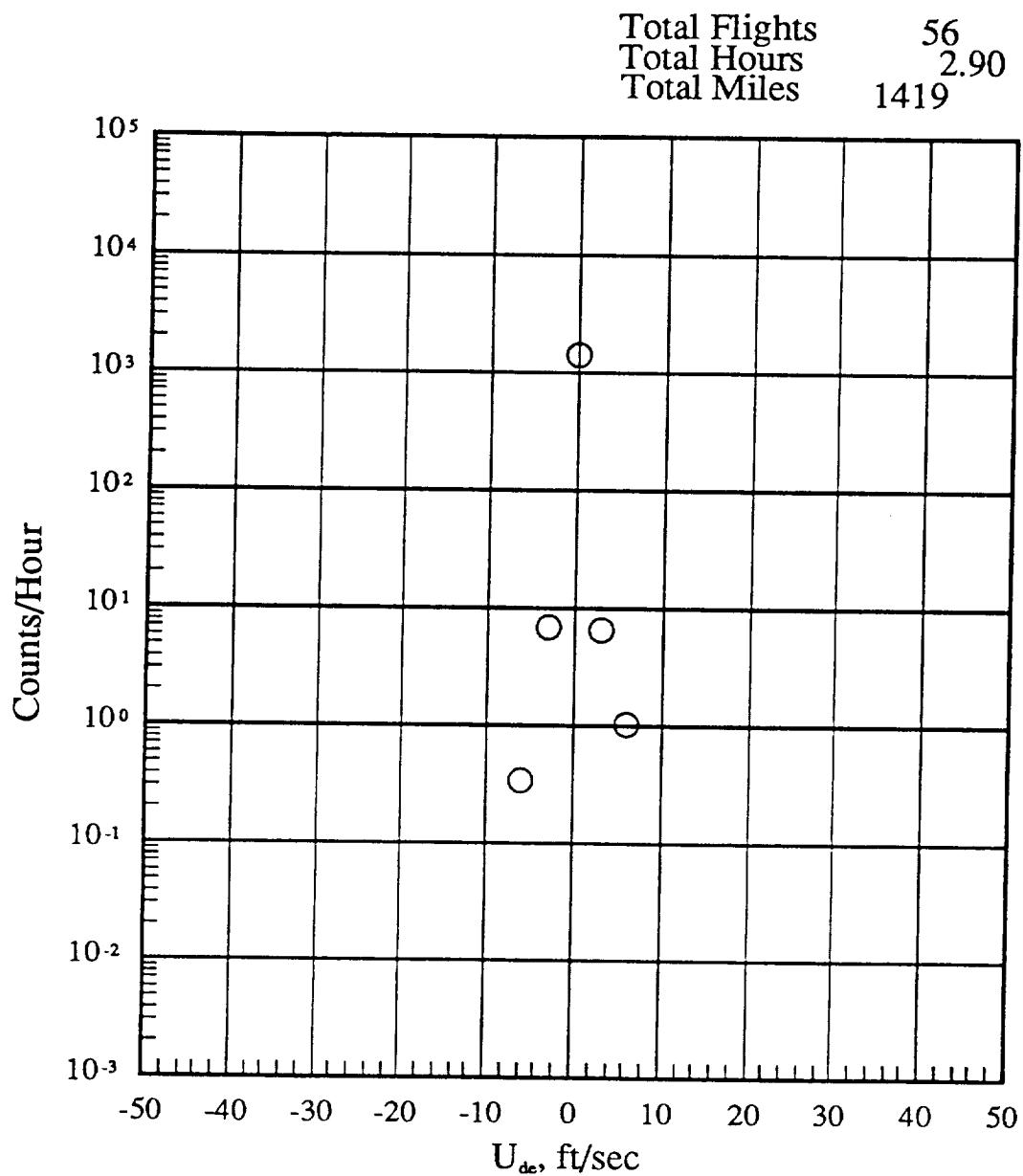
(g) 24500 to 29500 feet altitude

Figure 24.- Continued.



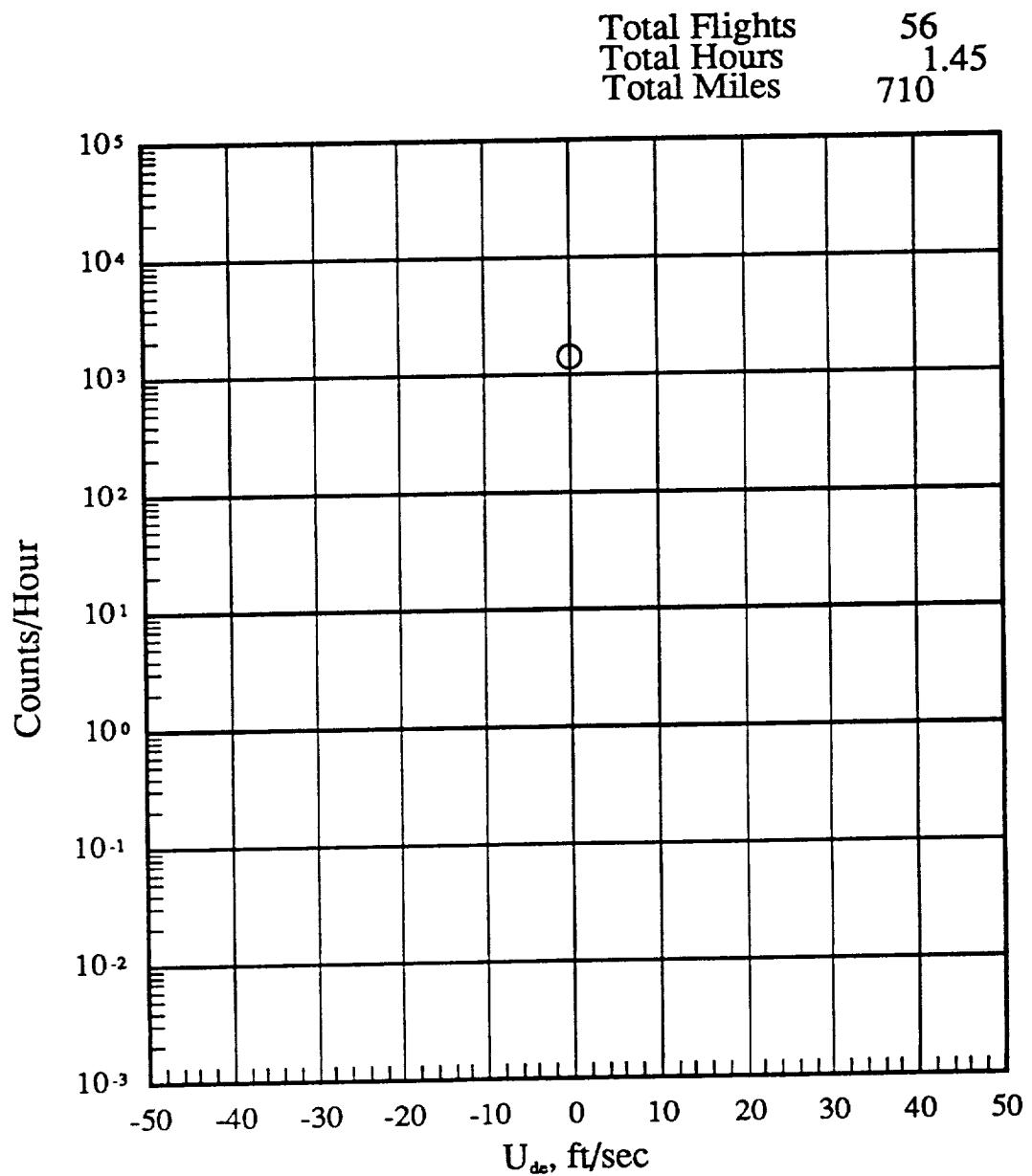
(h) 29500 to 34500 feet altitude

Figure 24.- Continued.



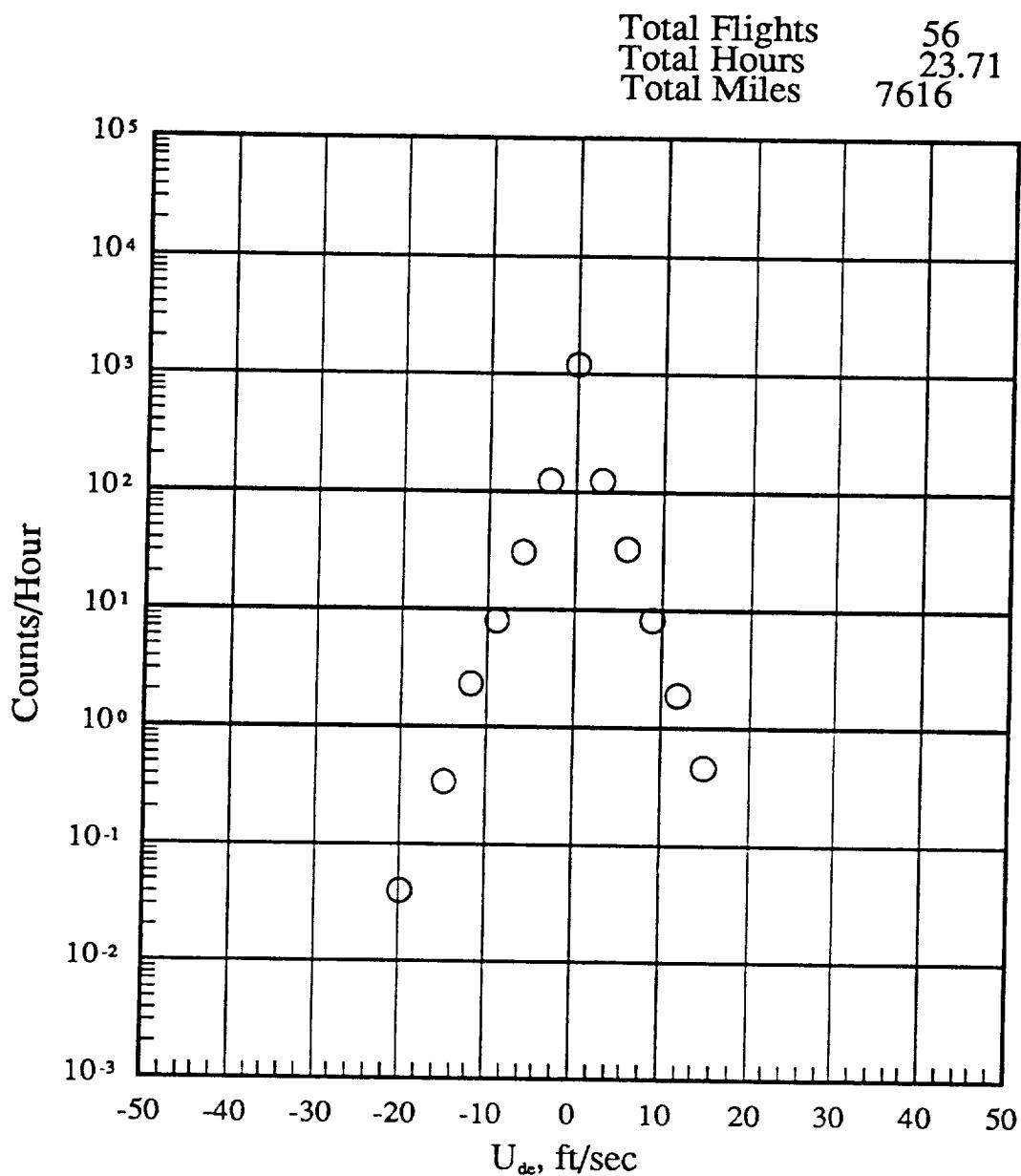
(i) 34500 to 39500 feet altitude

Figure 24.- Continued.



(j) 39500 to 44500 feet altitude

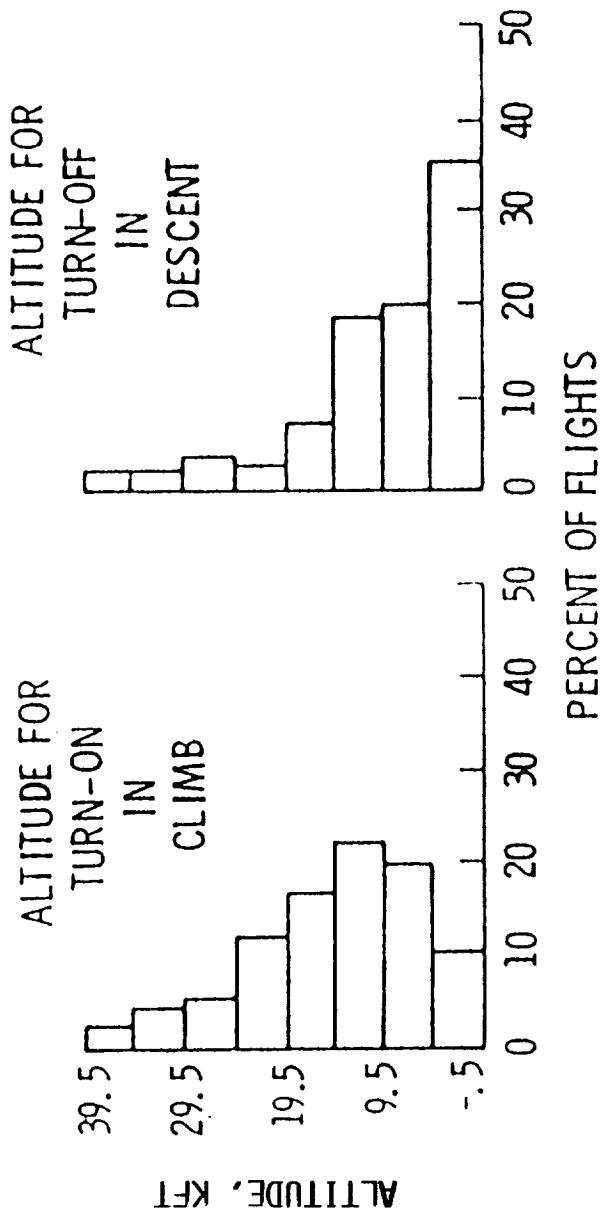
Figure 24.- Continued.



(k) -500 to 44500 feet altitude

Figure 24.- Concluded.

L-1011 FOR 373 HOURS OF REVENUE FLIGHTS  
1978



SUMMARY

- AUTOPILOT WAS "ON" ABOUT 75% OF THE TIME
- AUTOPILOT WAS "ON" AT TOUCHDOWN FOR 5% OF THE FLIGHTS
- AUTOPILOT WAS NOT USED ON 8% OF THE FLIGHTS

Figure 25. - Autopilot on-off statistics.

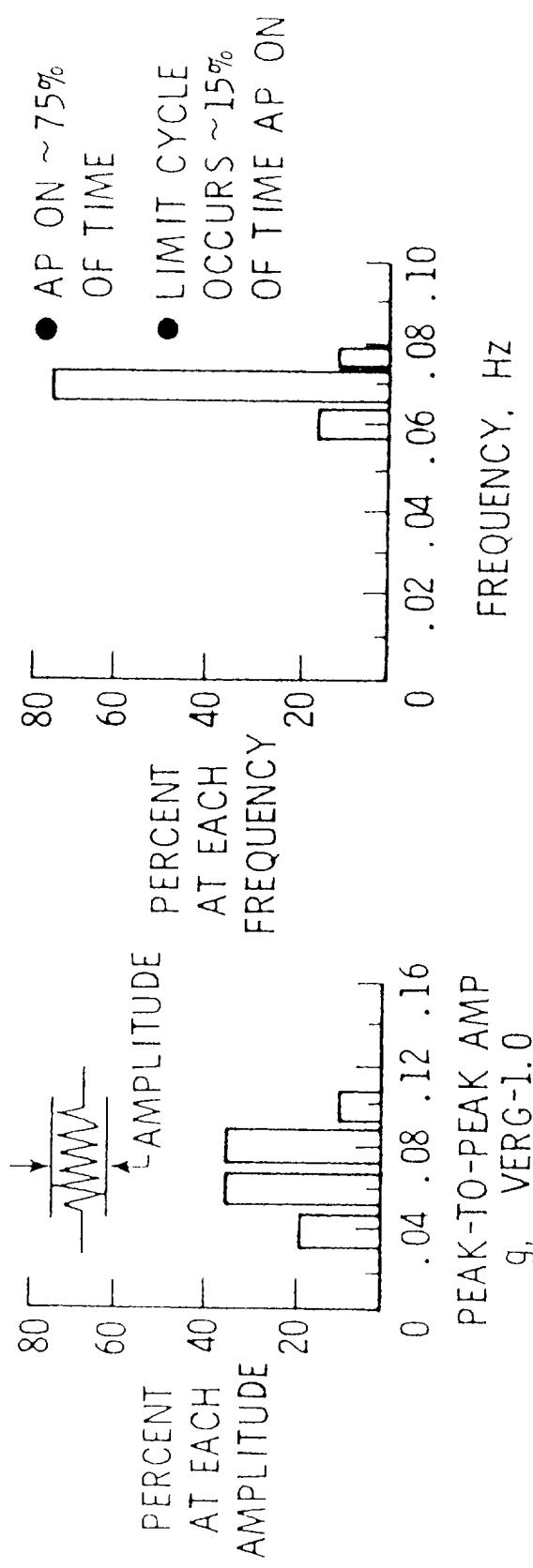


Figure 26.- Autopilot "limit cycle" experience.

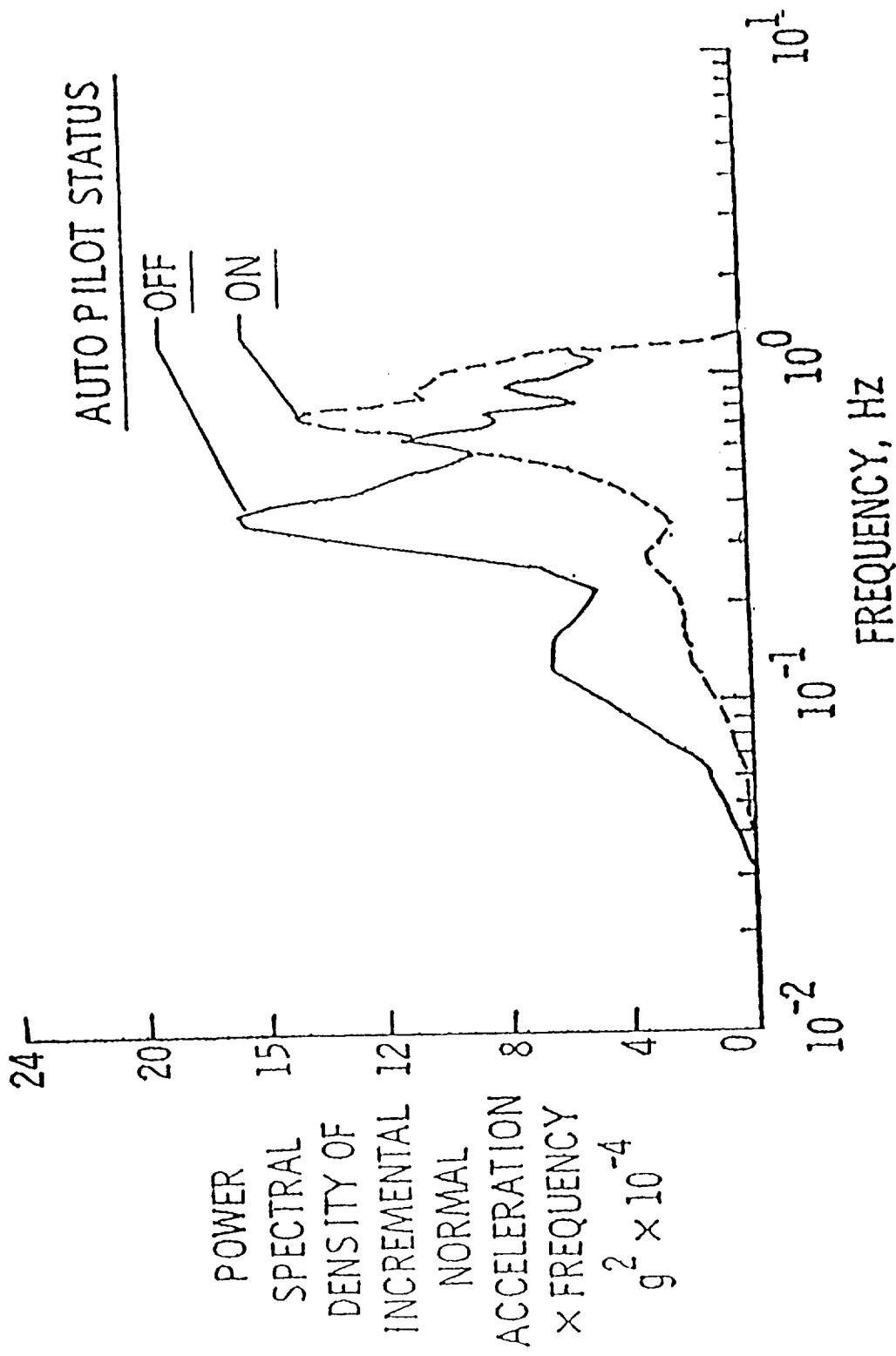


FIGURE 27.- Effect of autopilot on normal acceleration power spectra.



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